Plastics

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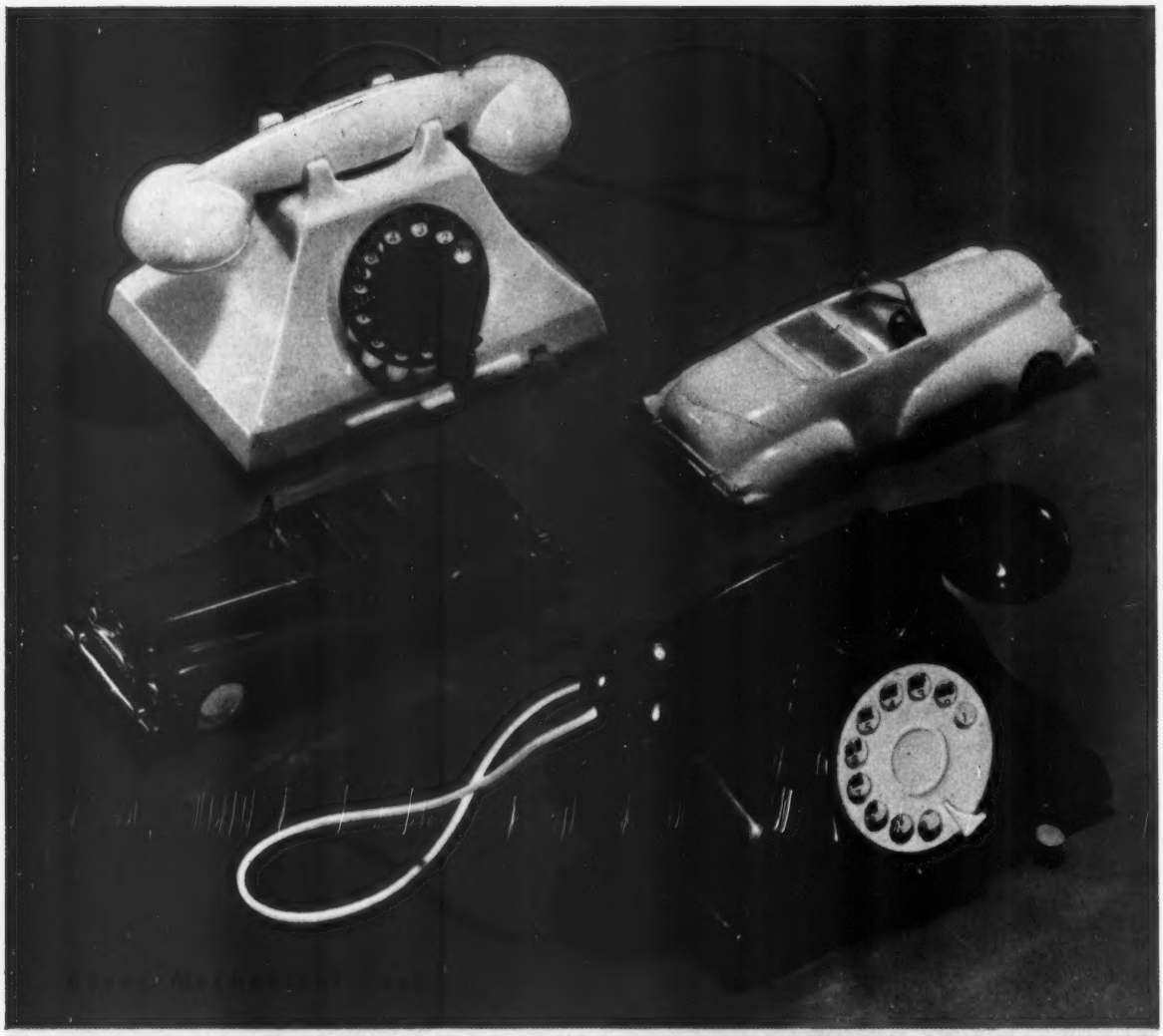

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Plastics

VOL. XV. No. 158 JULY, 1950

" The ancient uses of horn include its conversion into bows, examples of which are still found in India and China ; its use as a musical instrument (the horn of the wild bull tipped with silver, and slung in a silver chain, having been the true bugle-horn of former times), its employment in windows before the discovery of glass, and its conversion to purposes of defence, a complete suit of scale armour made of horn having been seen and described by Mr. Aikin . . . whose Lecture on Horn was delivered before the Society of Arts, and printed in their Transactions, vol. lii."

"Cyclopædia of Useful Arts." Edited by Charles Tomlinson. London, 1854.

EDITORIALS

Optimism !

OUR remarks in the June issue of " Plastics " regarding the good business obtained by moulding machine manufacturers, both at home and abroad and, by a number of moulders, of fairly good business abroad but rather static at home, may be supplemented by the news that for some, business is indeed excellent. More than one moulding firm has told me that there is by way of being a little boom, much of it being in the light industries, fancy goods and toys—one has confessed to excellent trade with Canada and the rapid installation of more machines.

Obviously, too, as we reported last month, improvement must come all round when the Chancellor, as is promised will give us better news and, we fondly hope, will release his grip on national spending as a result. As a significant indication of what we mean we may point to the heavy demand for telephones that exists and remains unsatisfied because of Governmental check. There is at the present moment a waiting list of more than 550,000, while London alone needs over 150,000. This does not, of course, include any future growth in housing not yet in process of being built and for them, of course, there is a still vaster demand. The section of our industry that specializes in telephones and, of course, in the accompanying units in this and other electrical jobs, would indeed be busy if the Post Office were to release supplies. The chairman of the Automatic Telephone and Electric Co., in his annual statement, has said that the waiting subscribers could provide the Post Office with over £6,000,000 revenue annually.

It is, of course, useless repining how prosperous we should be—if only . . . ! but we look forward with impatience to a continuation of the release by the Government, however reluctant, of all restrictions in whatever form. Meanwhile it is good to hear of this little boom, as also of other little bits of news, such as we have just received on the fitting out by Tenaplas, Ltd., of a Yugoslavia chemical works with British polythene tubing, and the spectacular, and, we hope, prosperous, venture, by British Moulded Plastics, Ltd., in arranging with the famous concern of Froy, Ltd., to market polystyrene tiles to the building trade. We have been anxiously awaiting such a development and no doubt Mr. Herbert Bridge has, too, for the past couple of years. Let us wish him plenty of polystyrene. Up the Monsantos! Up the Petrochemicals!!

Yet another piece of comforting news is the published result of the recent Anglo-Czechoslovak trade talks. Czechoslovakia's main imports from the United Kingdom will specifically include " plastic materials and manufactured goods." We hope the last two words mean " plastic manufactured goods."

Research at Bakelite, Ltd.

ON June 21 a host of friends in the industry travelled to Tyseley, near Birmingham, to see the new Research and Development Department that had recently been built by the company as an expansion and replacement of the old laboratories. They had been, in part, seriously damaged by bombing during the late war.

Thus begins yet another stage in the life of Bakelite, Ltd., with its magnificent work of 40 years in the field of phenolic resins. What is also so significant is that in the past few years the company has expanded its activities to include other thermosetting compounds such as urea and melamine products, and have also entered the thermoplastic field by the manufacture of vinyl plastics. This far-sighted move thus stresses the truth that we cannot segregate scientifically the individual plastics, however different their production and characteristics, however expedient economically such segregation has been hitherto. We are in a world in which giant molecules, natural and synthetic form the new continent for discovery and most plastics are complementary.

At Tyseley is concentrated all the pure research work and the technical development for future industrial problems and production of the phenolic compounds, and a complete pilot plant for resin manufacture and for the moulding and fabrication of all forms in which the resin ultimately finds its way into industry has been erected to form a guide to large-scale production. Study of the vinyl compounds and of urea and melamine resins is carried out at Aycliffe in Co. Durham.

We had been under the impression that research work on the phenolic resins had slackened in recent years throughout the world, although we had continued to hope, with the knowledge that many properties, such as mechanical strength, fell short of theory, that future research might open up new knowledge and practice. It is pleasing to learn that such work has not slackened; it is now intensified.

It is in the very sphere of examining the nature of the changes that take place in the final thermosetting stage of the " curing " of the resin that the research is being concentrated. More precisely it is the relationship between cross-linking to hardening that will tell us so much. As aids in this work,

synthesis is being carried out on modifying the chemical constitution of the intermediate products formed during resinification, so as to assure a greater degree of cross-linking, and many pure specimens of such rare compounds have already been prepared.

The development department is responsible for furthering the technical work to a manufacturing conclusion and necessitates co-operation with almost all industries and also Service departments and research associations in tackling the many problems that arise in fields ranging from normal pressure moulding and nuclear physics to radar or to colliery engineering. Thus we were able to see the efforts carried out to accelerate curing time, new cements for electric lamp caps, the latest methods in bonding grinding wheels, a new adhesive for metals, the new process for improving alkali resistance of these resins, the new work being carried out with laminates using silicones as bond to improve heat resistance and surface hardness and the use of nylon fabric as a base to give a good combination of electrical and mechanical properties.

At the lunch which followed the tour, Mr. H. V. Potter, managing director, gave us the history of Bakelite, Ltd., through the past 40 years. He himself played one of the most important parts on this stage in research and development and it was good to hear that this was to continue in a measure stronger than ever. He was followed by Mr. G. Dring, the first research chemist to be employed by the company and now Research Director. He told us that after his 30 years of work he was convinced the industry was still in its infancy and that the future held within it the certainty of even greater successes. We could scarcely refrain from cheering.

MOULDING POWDER AND SHOT

Giant Brabazon

I don't know who was responsible for inveigling Lord Brabazon of Tara to be chief guest at the Plastics Institute Lunch at the Dorchester on June 14 last, but whoever it was deserved our thanks. "Brab," as he is known in the world of flying, is a giant among men, for the great things he has done for his country and for the example he has given to adventurous youth. Holder of Pilot's Licence No. 1, he is Chairman of the Air Registration Board and the Brabazon Committee, and as such has been "responsible" for both the "Brabazon" and the jet-propelled "Comet." As a speaker he warmed the cockles of all our hearts. He said he knew nothing at all about plastics but, unlike a war-time chief guest, a one-time cabinet minister who tried to convey that the plastics industry was small and could never be anything else, Lord Brabazon knew of its importance and of its phenomenal growth in the last ten years. He knew, too, of its importance to the aircraft industry and told us some of the problems in it that the plastics industry must solve so that high flying may succeed. He made no bones of his dislike for mass-production and the consequent death of individual craftsmanship, but realized it was inevitable. Listening to him, I am sure we all wanted to tell him that the industry is sincerely endeavouring to bridge the gap by producing our new materials in high quality and good design and is steadily succeeding.

* * *

Polythene Bottles

Asked by a friend recently my choice of the biggest single future outlet for plastics, I plumped for the p.v.c. and polythene bottle. We've started well in this country, but America is probably making quantities expressed by a digit or two followed by 10^6, and the field is absolutely as wide open as anything. With good propaganda it would be a very real competitor with glass. My friend complained that the waxy feel of polythene was a deterrent, which I thought a matter of opinion. I note, however, that it is possible that other people think the feel can be improved since I see a patent, B.P.631,013, by a British concern, which provides for an outer covering of a more thermo-stable form of plastic, e.g., regenerated cellulose, which is applied by heat and pressure.

* * *

Heart-break House

Looking through a peep-hole at a recent meeting of the Papers Committee of the Plastics Institute, I saw tears streaming down the haggard cheeks of those brow-beaten, over-worked individuals who spare no effort to get the papers that are read before the various Sections into shape and in time to be printed as the Transactions. Erstwhile strong men such as Alan Speedy, Harold Lusty, Alan Percival, Phillip Morgan and Artemus N. Other seemed but shadows of their former selves. The reason? Well, it's all very sad, but authors of papers have not yet formed the habit of making copies of the originals to send to the Local Section Secretaries (who get all the resultant kicks) for forwarding to the aforesaid committee. The latter, poor devils, are often completely in the dark as to what is being read in some sections other than the bare titles and have little time to do the editing. Hinc, as somebody has already said, ille lacrimæ, and if you want some more foreign words: Si jeunesse savait—si veillesse pouvait, which I am given to understand means that if the young 'uns had more sense and the old 'uns a bit more strength to tap out an original plus a copy, it would save a lot of headaches at headquarters.

DOGSBODDY.

Closing Thoughts on the B.I.F.

WHILE many of the photographs of the stands at the British Industries Fair were such that the moulded and fabricated units were adequately seen, it was manifestly impossible to show in them all the important exhibits because of their size or the limitations of space. We have therefore included in the following pages a few of those exhibits which were omitted and seem of special merit.

Among objects which clearly leaped to the eye, both for their design and for the quality of their production, were two vacuum flasks, the "Excelvac," moulded by British Moulded Plastics, Ltd., and the other moulded by Roanoid, Ltd. Presumably they should be described as jugs, because of the attached handles. In design both are very different, the "Excelvac" being of rather severe, completely modern form, yet supremely pleasing with the severity relieved by the introduction of two colour mouldings, and circle motif in the black base. The handle is appositely modern, conforming to the simple vertical lines of the whole structure. It is moulded for the Excelvac Flask Co., Ltd.

The jug by Roanoid, Ltd., which this company has executed for use on the ships of the Holland-America Line, is a copy or close copy of an antique Dutch jug, and may to this extent be termed conventional. The graceful lines of the elongated neck, which drop to the more strongly defined base, show a perfect symmetry and balance in no way spoiled by the deep handle. The central band, which obviously covers the threaded joint between the two mouldings, may not have been present in the original, but in no way detracts from the general lines.

It is interesting to note that, while the two differently coloured mouldings of the first vacuum jug enhance its beauty, that of the second jug is accentuated by the unrelieved use of a single cream colour.

Our next selection is, by contrast, completely technical and illustrates one of the advances made since the entry of plastics into the photographic industry. It is a photographic developing tank, noteworthy for its large size, robust mechanically and resistant to the chemicals which it must contain. It is fabricated from reinforced cellulose acetate by Thermo-Plastics, Ltd., of Dunstable.

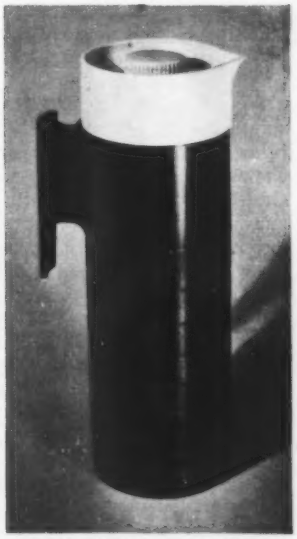
Yet another severely technical job of note, with no pretensions to beauty, even of line, to judge from the photograph of it, is that of a polytetrafluorethylene gasket and tape. In this new polymer, now known generally as P.T.F.E., the chemical and the electrical engineer sees how more closely plastics are approaching to the ideal in some of the materials they used for construction, for it possesses not only extremely high resistance to chemicals, but also (strange enough for what comes under the heading of thermoplastics) resistance to heat up to 400 degrees C., which is ample enough for a vast number of chemical applications and, so far as resilient plastics are concerned, is surpassed by no other. It is thus of exceptional value for making gaskets and gland packings for hot-acid pumps and other machinery. Indeed, so valuable is it that its price (stated to be about £5 per lb.) is no deterrent to users. What the future holds for this material in other forms depends, obviously, on progress in the manufacture of moulding and forming machinery, which necessarily must be slow. The new plastic is manu-

Display basket moulded in cellulose acetate (British Moulded Plastics, Ltd.).

Polythene bobbin for James Templeton and Co., Ltd. (Roanoid, Ltd.).

Vacuum jug for a Dutch shipping line (Roanoid, Ltd.).

Wicker basket incorporating cellulose acetate extrusions (Courtaulds, Ltd.).

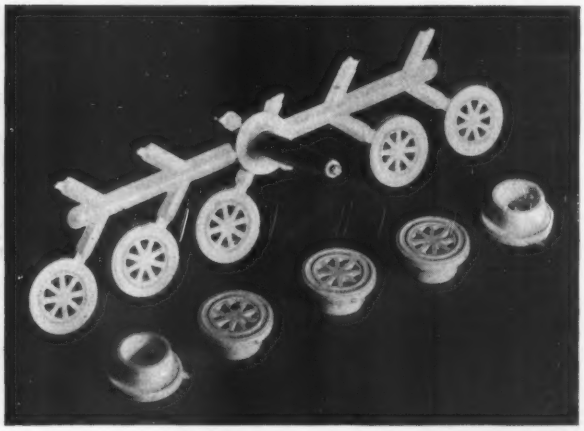


"Excelvac" vacuum jug (British Moulded Plastics, Ltd.).

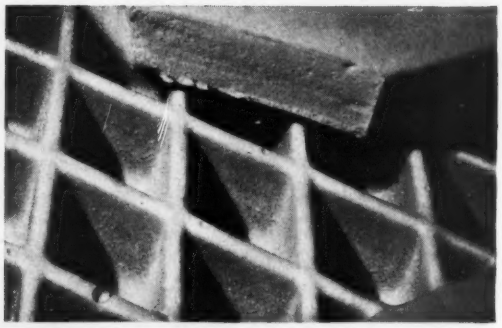
(Above) Magician's hat novelty.
(Injection Moulders Ltd.)

(Left) Toy conducting clown.
(Injection Moulders Ltd.)

Photographic developing tank in reinforced cellulose acetate.
(Thermo-Plastics, Ltd.)



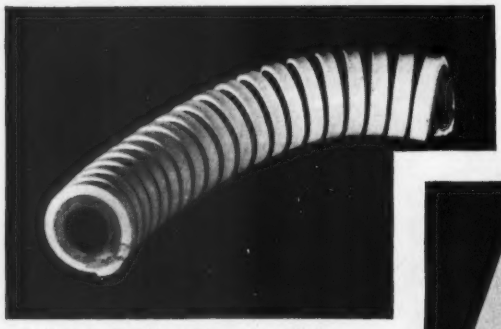
Mattress air-vents in cellulose acetate.
(J. F. Kenure Ltd.)



(Above) "Aero - Jablex" cellular insulation.
(Moulded Components (Jablo) Ltd.)

factured by I.C.I., Ltd.; gaskets of "C.F.2," which is produced by controlled processing of P.T.F.E., are made by Crane Packing, Ltd.

Sooner or later the plastic basket was sure to appear on the scene, and here we have two examples, each of a different character and process of manufacture. One is composed partly of wickerwork and partly of Courtauld's extruded cellulose acetate, the latter in strong contrasting colour, lending attractiveness, strength and long life to an already strong utilitarian structure. The handle, two edges and the four dark "stripes" in the body are of the extruded strip. The second basket owes nothing to convention but its general shape. It is a rigid form moulded in two parts from cellulose acetate and bears a decorative motif both in the body and handle which segregates it from the purely utilitarian. It is indeed a display basket for use by florists, fruiterers and possibly by hotel

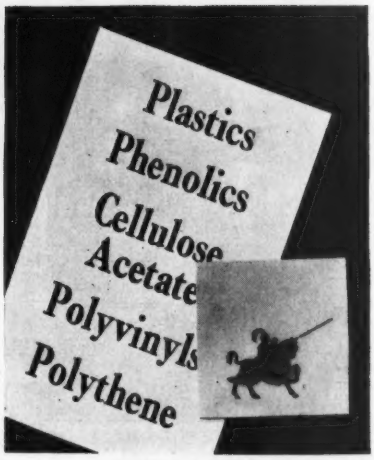


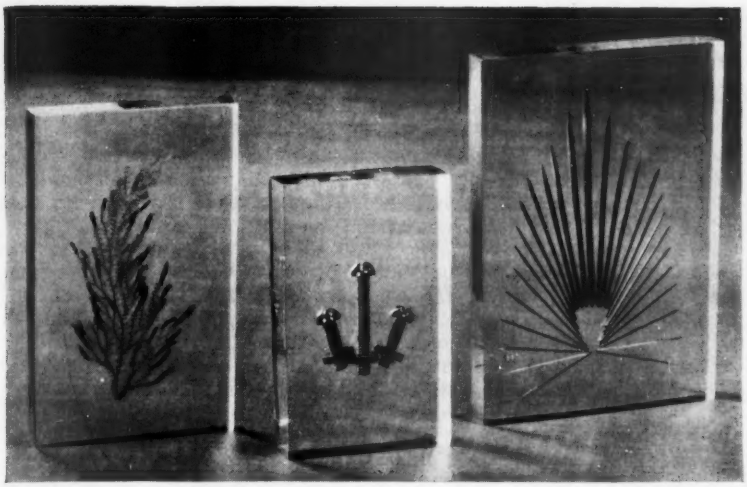
(Above) Flexible tubing with double wall of soft and hard p.v.c., as made on twin extrusion machine by R. H. Windsor Ltd.

restaurant managers who have not yet had the courage or the sense to emulate their European opposite numbers by placing a pretty basket of fruit on the dining table.

Turning to toys, little of complete mechanical novelty was seen in the plastic section, other than those exhibited by Injection Moulders, Ltd. Here were two

(Below) Printing on plastics.
(Masson-Seeley Co., Ltd.)

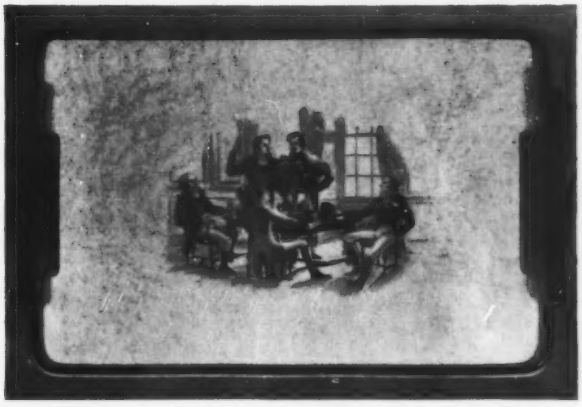




Examples of embedding in polymethyl methacrylate. (T. Gerrard and Co., Ltd.)

"Gibson" nursery clock with "Formica" face. (Baume and Co.)

Gasket and packing ribbon in C.F.2 polytetrafluorethylene. (Crane Packing Ltd.)



Tray with interlaminate decorated "Warerite" base. (D.E. Plastic Development Co.)

of already proved success and great promise—the Magician's Hat, complete with disappearing rabbit, and the Conducting Clown. All essential parts were of injection-moulded cellulose acetate.

Two rather novel uses of laminated material were shown on our own stand by the courtesy of the individual manufacturers. One, a "Gibson" clock, with a face of specially designed "Formica," by Baume and Co., is presumably intended for the nursery in view of its clarity and simple animal portraiture; the second, a pleasant-looking tray, again with the design incorporated into the laminate, which is of "Warerite." On the tray, the raised surrounding edge, to prevent slipping off of glasses, is of metal, presumably extruded aluminium tube. While the inclusion of an 18th-century winter's morning carousal on a 1950 laminate may not appear to be completely congruous, it is a brave essay (the first, we believe, in this special field) by D.E. Plastic Development Co., Duke Street, Cheltenham.

A completely new application to us were the air-vents manufactured for "Slumberland" mattresses by J. F. Kenure, Ltd., and seen on Courtauld's stand, since the raw material is Courtauld's cellulose acetate. These injection mouldings can easily be incorporated into the mattress fabric, on which they exert the minimum of wear while providing necessary ventilation to the sprung interior.

Several readers have asked for a more complete description of the flexible tube we saw being made on the Windsor twin-screw double-extrusion machine at Castle Bromwich, so here it is. As will be seen from the photograph, it has been made in two colours for emphasis of the excellent results, since both inner soft tube and outer hard spiral covering weld together during the actual extrusion and cannot be separated.

A pleasing and growing use of cast acrylics was seen on our own "Plastics" stand, the exhibit being loaned to us by T. Gerrard and Co., Ltd., who are experts in the delicate, yet technically useful, work of embedding objects.

A new raw material of rubberlike texture was seen on the stand of Moulded Components (Jablo), Ltd. Known as "Aero-Jablex," it is an expanded polymer which is being exploited in the furniture field for chair and settee seats. The cellular structure of the material itself provides great lightness, while the larger, cell-like structure of the moulding, as used for seating, provides ventilation. It is stated not to degrade with time.

One other photograph is not included as an example of the moulder's or fabricator's art, but of printing on plastics. The Masson-Seeley Co., Ltd., whose special machines for printing on a variety of manufactured goods have been famous for many years, have now produced types for printing on any plastics. The process in general is one of heating the object slightly and using metal type or dies with an "inked" film to embed colour in the impression made by the type or die. The example of printed acetate shown was done in our presence. The smaller example is one of a two-colour impression, the colours being irremovable. This concern informs us that it has now also succeeded in printing on p.v.c. and on polythene.

Plastics in Building—I

By JOSEPH B. SINGER, B.Sc.(Arch.)

IN periods other than our own the sources of raw materials for building were usually in proximity to the building site, and preparation took place within a distance conditioned by transport facilities. To-day, a complete change has taken place; there is increased tendency to decentralize operations. Raw materials are procured independently of the actual task of building, and their choice is determined by the type of structure. The possibility of prefabricating whole units has brought about a new development in technique, but transport economy remains a factor which has not altered substantially. Bulk and weight of materials still play an important rôle in assessing the overall cost of building.

In the past, building materials were expected to last for centuries, and the amortization period of buildings was quite considerable. To-day, the conception of permanency has changed; the importance of time-durability has diminished. This transition has a significant bearing, particularly on those materials whose resistance to wear and exposure can be only empirically established.

Broadly speaking, the division between permanent, semi-permanent and temporary materials has been generally accepted, although the borderline between the three groups is very flexible and the only criterion is the lasting quality of the material without the necessity of frequent maintenance.

Applied to building, plastics have passed through two phases. First, there was, in theory, enthusiastic acceptance of the new materials as likely to be capable of solving intricate problems in this field of usage. In the second phase, which was a logical consequence of the first, there was a reaction tinged very strongly with scepticism about the future of these materials in building. Yet gradually there came a realization of the true properties of plastics, their advantages and their limitations, and it became possible to restore balance between excessively imaginative optimism and consequent discouragement.

The analogy, with the advent of metals versus traditional materials, can be instructive in comprehending the scope of plastics in the immediate future. Metals have superseded some traditional materials in certain spheres, but in other fields they are used side-by-side in order to fulfil different requirements. However, this analogy may still be somewhat misleading, because plastics, unlike metals, offer more scope for improvement in properties and possibly unlimited extension in application.

Analysing the reasons for the slow acceptance of plastics as building materials, the fact stands out that traditional materials have been well established through the test of time. Although the only basis for assessing a new material is a practical trial, there is, nevertheless, a reluctance to experiment with materials of uncertain properties. Further, previous experience of deficiencies, due to bad design of building components, or inadequate knowledge of the material used, may have some bearing on the present position. The use of a new material, involving the risk of failure, may also have repercussions affecting client and architect.

The demand for a certain type of article depends very largely on its suitability and good design, but mere substitution of plastics for traditional materials is liable to transform building components into imitations of old forms and produce designs that are inconsistent with the nature of the material. The established products can only provide a guidance in the function and use of a particular component. The inherent properties of new materials are bound to necessitate a different manner of construction, fixing and finishing. The co-operation between the plastics and building industries, however, is essential to reduce waste and ensure co-ordination between theoretical experimentation and practical utilization, and subsequent production of components that fulfil their function and satisfy the æsthetic sense of the user.

In 1941, the Ministry of Works, fully aware of the rising importance of plastics, invited the British Plastics Federation to convene a committee for the purpose of submitting a report for inclusion in the Post-War Building Studies. This committee published its report in 1944, in which it surveyed different aspects of plastics in building and put forward recommendations on the direction of future investigations. From the outset it has been realized that the total volume of production of plastics is small in comparison with the production of brick, steel and cement, and therefore plastics cannot compete with the conventional building products of these basic industries. The limitations of the materials and the productive capacity of the plastics industry, however, have been instrumental in turning the efforts of the investigators into promising channels of research in the field of building, and this series of articles reviews the recommendations of the committee in the light of past achievements, likewise discussing new possibilities.

Structural Members

The use of plastics for structural members has been the subject of many experiments. Tests have been carried out on tensile members in particular, and although an ideal plastics section has not so far been designed, results obtained were sufficient to provide useful information about the structural properties of plastics. Wood and steel served as a basis for comparison, but, in spite of some advantages, plastics sections proved to have a disproportionately low modulus of elasticity. The material also lacked ductility, which is essential in distributing stresses throughout the member. Furthermore, the strength/weight ratio of plastics was not much higher than that of steel, and consequently the necessity of increasing the section to obtain an equivalent strength reduced the effect of the saving in weight.

These findings led to the conclusion that plastics have inadequate mechanical properties for structural use; therefore in considering their application for load-bearing members the valuable attribute of low density has to be exploited by reinforcing plastics with a material of higher modulus of elasticity and ductility. Low density is particularly advantageous where flexural rigidity is important; thus, the design of a member involves the combination of materials that can give an optimum value for the ratio of modulus of elasticity to density (E/ρ).

The flexural strength determines the resistance of struts, compression flanges of beams and shear members to buckling. A low-density material enables one to design thicker sections for the same weight, with a simultaneous and proportionally greater increase in flexural rigidity.

The field of metal-reinforced plastics has been very little explored. Some new developments suggest themselves as a result of the theoretical analysis and past experience. During the war a composite panel, known as "Plastel," was evolved; this consisted of metal sheets stabbed all over with small burrowed holes, whose re-entrant edges interlocked with a plastics material, and the stiffness of the sandwiched panel was greatly improved by the use of synthetic resin cements. Tests have shown that, although the flexural strength of "Duralumin" was seven times that of steel, the sandwiched panel of steel with plastics was 2½ times stiffer than

"Duralumin." This war-time development is interesting, as it shows the exploitation of the principle of bonding metal to plastics, which could be carried further in various new applications.

Similar laminated-plastics members reinforced with thin aluminium or steel sections may be envisaged or, alternatively, a multiple laminate with two layers of metal foil and intermediate plastics sheets could be built. Only actual experiments can furnish the data regarding the relative merits of each method. The metal could be used internally to provide a continuous core, but the main emphasis would be laid on its utilization for the tensile part of the member, while the compression flange would be largely formed of a plastics material. The purpose of plastics would be to impart the necessary flexural strength to the flange in compression, to saving in weight, and to the provision of a protective coating for the metal. Thus, an economy of steel could be achieved, combined with the possibility of using structural members that do not require a special surface treatment.

Laminated wood is an extension of the principle of combining synthetic resins with a material possessing a greater degree of ductility, where comparatively narrow and thin strips of wood are cemented together to form a laminated structural unit. Laminated wood differs from plywood in this respect: the grain in the consecutive plies for laminated wood are parallel, but in plywood they run at right angles to each other.

Originally, casein glues were used for bonding the plies, but their use was restricted to places where the moisture content of timber did not rise above 20 per cent. and, further, the weakness of the casein glue line when it becomes wet imposed limitations on the employment of laminated wood externally. The use of synthetic-resin adhesives, namely, urea in Germany and phenol-formaldehyde in Britain, dates from 1930, but the adhesives have now been greatly improved and new types added to the list. The phenol-formaldehyde and resorcinol-formaldehyde types are the most durable, and they are completely impervious to moisture and decay.

The method of laminating wood has the advantage of reducing the waste of timber to a minimum, and the end-to-end scarf jointing enables great lengths to be obtained. Thin strips of wood are assembled and bent simultaneously, and there is no restraint on the ends of any particular strip in sliding over each other during the process of bending until the setting has taken place. Subsequently, the strips are fixed to a shape and restrained individually in their relative movement. The best method of bending laminated wood is by use of fluid pressure, i.e., an inflated rubber hose is inserted between the assembled laminæ and the form, thus applying the pressure evenly and radially. The bending of thick laminæ is usually carried out by placing them, with the mould, in an autoclave, where greater pressure can be applied.

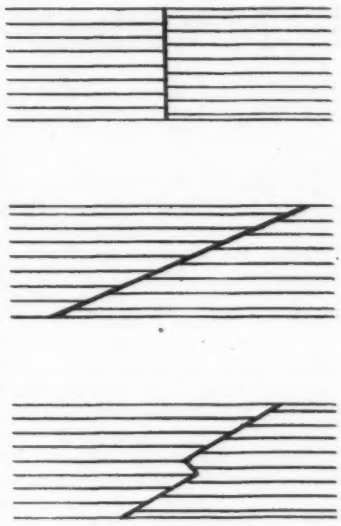


Fig. 2.— Laminated wood: methods of jointing.

The allowable stresses in the laminated members are higher than in timber, on account of lowered moisture content and a reduced elasticity. Unlike timber structural components, which have constant dimensions, the laminated members can be tapered in accordance with the stress distribution. Even in countries like America and Sweden, where the production of steel and the position of wood remains unchallenged, there is a growing tendency to employ laminated timber structurally in large buildings, such as workshops, warehouses, gymnasia, and even aircraft hangars.

Laminated wood compares favourably with steel in fire resistance, and this fact has been taken into account by fire-insurance companies. It can also provide strong, graceful and efficient framing for buildings, and some of the most dramatic structures of this century have been designed in this new medium.

"Improved" wood was developed in Germany and France and introduced to this country in 1930. Various processes are employed for impregnating and compressing solid timber or veneers. A new process claims to convert softwood into hardwood by impregnation and compression. The process consists of subjecting wood to vacuum for the removal of moisture, and applying a solution of methylol urea under pressure to force the resin into the wood fibres.

A more homogeneous material is obtained by using wood cut into thin veneers, which are dried and impregnated with phenol-formaldehyde. The impregnation is carried out at atmospheric pressure, either by immersion or by spreading with liquid resin; the time of immersion depends on the thickness of the veneers and the required percentage content of resin. Alternatively, the veneers are taken to the vacuum-impregnation chamber, where the vacuum and pressure cycle is carefully controlled. The veneers are combined in a number of ways, depending on their intended purpose; they are arranged in layers with grain in one direction to resist torsion and bending, or with alternate grain at right angles to each other to resist compression. The assembled veneers are pressed to prevent warping and heat is then applied. The time of applying heat and pressure depends on the extent of the heat and the pressure.

The resulting "improved" wood cannot compete with ordinary wood owing to its much higher cost; it is intended mainly for the replacing of metals. It is stronger than steel, weight for weight, and the relative strength/weight ratios in tension compare as follows: Steel 7.7, spruce 9.0, "improved"

(*Continued on page* 186)

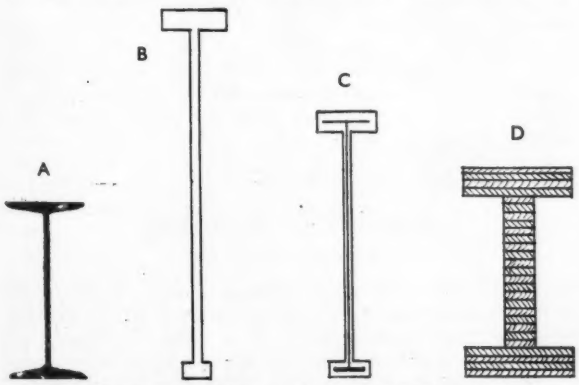


Fig. 1.—Structural members: A, rolled steel joist. B, Gordon Aerolite beam. C, metal reinforced plastics. D, laminated wood.

Table 1.—Comparison of strength: Rolled steel joist and Gordon Aerolite beam.

	Steel	Gordon Aerolite
	lb./sq. in	lb./sq. in.
Tensile strength	18,000	45,000
Compressive strength	18,000	24,000
Young's modulus	30×10^6	6×10^6

Moulding and Extrusion of Polyethylene

Summary of a paper by Mr. S. W. Jargstorff, Bakelite Division, Union Carbide and Carbon Chemicals, read before the Newark Section, Society of Plastics Engineers, Newark, N.J., February 8, 1950.

TO produce one pound of polyethylene, approximately 15 cubic ft. of ethylene are needed, that is, assuming 100 per cent. conversion of the gas to the polymer. On this basis, roughly one billion cubic feet of purified ethylene are needed for this year's supply of polyethylene in the U.S.A.

During 1943 the price of polyethylene was approximately $1.00 per pound; to-day the price is 44 cents per pound for the base resin in carload quantities. This decrease has been a direct result of technical development in the processes of manufacture. The phenomenal, and not fully expected, demand has also had an influence. Ultimately polyethylene may become one of the lowest-priced resins available.

Most of the polyethylene consumed in the U.S.A. to-day is used either in moulding or extrusion applications of one kind or another. Only a very small amount of material is being used in calendering operations. A very considerable interest is taken in the use of polyethylene for paper coating by a process involving flat film extrusion followed by lamination to the paper.

Some grades of polyethylene are being used as wax additives to improve the quality of waxes, especially with respect to softening temperatures, heat sealing performance, non-blocking, surface gloss, abrasion resistance, etc. A substantial portion of the bread-wrapping paper used in the U.S.A. to-day is coated with a polyethylene modified paraffin wax.

It is used as a replacement for leather in the moulding of spectacle cases and boxes. Bottle moulding is consuming vast quantities of polyethylene, and is expected to require even larger quantities in the near future. Polyethylene of 50-80 mesh granulation is being used for flame-spraying operations for protecting steel and concrete surfaces.

No fewer than 40 grades of polyethylene varying in molecular weight and attendant physical properties are possible from present manufacturing processes. Of these only about five have been manufactured in the U.S.A. in commercial quantities. The various grades vary in molecular weight from 1,000 to 40,000. Of the materials which have assumed commercial importance, the lowest member has a molecular weight of about 7,000, and the others vary in molecular weight from 12,000 to 23,000. The grade generally used for moulding and extrusion work is an intermediate grade with a molecular weight of about 21,000. The material of lowest molecular weight, namely, 1,000, is of a grease-like consistency at 200 degrees temperature. It is of some importance as a special lubricant.

The grades used as wax additives may comprise all those at present being manufactured, and generally 2 to 5 per cent. of polyethylene is added to the wax. For paper-coating work, resins with a molecular weight of 12,000 and 19,000 respectively are used in greatest abundance. For general moulding and extrusion the base resin is one of 21,000 molecular weight, and for monofilament and certain wire-coating operations a molecular weight of 23,000 is employed.

The same base resin is used for general moulding and extrusion operations, but the actual compounds for these techniques exhibit vastly different performance characteristics. The extrusion grade of polyethylene is especially processed to eliminate gel particles as much as possible, and to provide a smoother extruded product with superior clarity.

The common moulding temperature for polyethylene is 450 degrees F., although some moulders have justifiably used lower or higher temperatures to accomplish definite aims. In the moulding of bottle caps, for example, a cylinder temperature as low as 275 degrees F. has been employed to effect short operating cycles and low unit cost. In other applications temperatures as high as 600 degrees F. have been used to eliminate mould springing and flashing at the sprue.

Just as cylinder temperature is important in the moulding of polyethylene, and may have to be varied to suit the particular job, so mould temperature is important. In certain operations a cold mould is quite necessary, whereas in others a warm mould is quite essential. To eliminate surface skinning, a cold mould is definitely advantageous. To produce better than usual gloss on the moulded article a warm mould should be favoured. For most polyethylene moulding operations a relatively short injection dwell seems desirable to avoid binding of the moulding in the cavity or on the core. If the dwell is reduced too much, sink marks will appear.

For profile extrusion operations, front cylinder and die temperatures of the order of 350 to 400 degrees F. are commonly used. For thin film extrusion temperatures as high as 550 degrees F. may be required when extruding flat stock, and lower temperatures of the order of 350 to 400 degrees F. may be preferred for tubular film extrusion.

In the extrusion of flat film a rate of 80 to 100 lb. per hour is quite common with machines equipped with a 3½- to 3½-in. worm, and correspondingly higher rates are obtained with larger machines. Water quenching of the film is quite common during the extrusion of flat film. In the extrusion of thin wall polyethylene tubing, however, air cooling must be used, so that the extrusion speed automatically becomes a function of rate of cooling. If the tubing is extruded faster than it can be cooled it will block when passed through the pinch rolls.

At the present time there seems to be three large applications for polyethylene film, namely:—

1. As a Holland cloth substitute for stacking camel-back in rubber manufacture.
2. For food packaging.
3. For consumer items.

In the coating of paper with polyethylene it is feasible to extrude a flat film and laminate it to the paper as both pass over a cooling roll. Coatings varying in thickness from 0.5 to 10 mils may be applied at speeds up to several hundred feet per minute. Approximately 15 lb. of polyethylene are required to apply a 1-mil coating of polyethylene to a ream of paper (3,000 sq. ft.). For requirements calling for high gloss and very high speed production, a low molecular weight material (12,000) seems desirable. Where abrasion resistance is of some importance higher molecular weight polyethylene may be advantageous.

Plastics in Building

(*Continued from page* 185)

wood 9.3. The importance of densified wood, however, lies in the improvement of dimensional stability, lateral strength, toughness and surface hardness of timber; indeed, the possibility of converting softwood into a high-grade structural material is of great importance. The economical use of wood, its lightness and strength, and durability under exposed conditions, are valuable assets which commend further research and investigation.

Applications of plywood have been recently extended to structural components. The value of plywood lies in its distributed strength and non-splitting quality. Plywood ribs and gussets have been used for building-up roof trusses and similar constructions; phenolic resins are used for the joints in plywood, and urea resins for assembly joints.

World's Industry Employs Plastics

GENERAL ENGINEERING

A shaper tool guard, consisting of a bent piece of transparent acrylic sheet, has been suggested by A. W. Payne. The guard is closely fitted to the tool, thus preventing hot shavings from hitting the eyes and face of the operator. ("Modern Machine Shop," 1950/May/247.)

Low-pressure moulding phenolics.—E. F. Borro discusses the advantages and possible applications of this technique. ("India Rubber World," New York, 1949/No. 6/707.)

Vinyl finishes for aluminium alloys.—W. A. Edwards describes the results of tests on a new type of stoving lacquer of superior mechanical and surface-protecting properties. Ease and economy of application are said to be outstanding. ("Light Metals," 1950/June/336.)

Pressure tests on laminates: W. G. Ranke developed a satisfactory test procedure to determine the rate of air transmission of plastics. Thin glass fabric base plastic laminates, or honeycomb core sandwich construction with thin glass fabric base plastic faces as produced by bag moulding may show an unsatisfactory air transmission rate. (Report AAF TSEAM M/5227.)

Interlaminar strength of reinforced plastics: An investigation into various methods of measurement, including shearing, delamination, endwise compression and transverse tensile tests were made by F. T. Barwell and K.W. Pepper; leading to interesting results. ("Proc. 7th Int. Congress for Appl. Mechanics," 1948/Vol. 4/278.)

Calendering of plastics.—Approach of mathematical investigation by R. E. Gaskell, considering the special properties of plastics differing from those of metals. (A.S.M.E. Annual Meeting paper 49-A-34, "Mechanical Engineering," 1950/Jan./30.)

Mould die lubricant.—"Moldeze" (Protective Coatings Inc., P.O. Box 3985, Detroit, 21) is said to prevent plastic compounds from adhering to moulds and dies. It does not cloud, matt or watermark the finish of translucent or transparent plastics. ("Materials and Methods," 1949/Dec./106.)

Special moulds.—J. J. Johnescu gives a few examples of plastic moulds of advanced design, including double-deck moulds and plunger-type transfer moulds. ("Machinery" (N.Y.), 1950/Feb./169.)

ELECTRICAL

Improving the covering of wire with plastics and rubber. According to B. J. Dalton, a considerable improvement can be obtained by automatic control of the extruder. ("Rubber Age" (N.Y.), 1949/No. 1/59.)

Insulation of electrical machines.—K. Tardel surveys systematically all materials used for insulation. ("Elektro-Technik" (Coburg), 1949/Vol. 31, No. 44/3.)

"Slotted line" for measuring electrical factors for 60 to 2,000 megacycle range is a combination of aluminium, stainless steel and plastics. ("Product Engineering," 1950/Feb./95.)

Arc-resistant paper laminates with low electric loss have been developed by A. L. Alesi and coll. They are a modification of melamine-formaldehyde resin by butoxydiaminosilane, resulting in improved mechanical and electrical characteristics of the laminate without impairing arc-resistance. The properties exceed those in fixed specifications. (U.S. Dept. of the Army Project No. 99-15-022 Signalcorps Project 152 B.)

Electrical testing of plastics.—W. Krassowsky compares the American Standards with the German methods and shows that the American Standards can help to improve the German Standards. ("Kunststoffe, 1950/Mar./95.)

MISCELLANEOUS

Pressure sensitive tape produced by Minnesota Mining and Mfg. Co. is made of glass fibres with an acetate film back. Filaments are embedded in a resilient rubber adhesive. ("Modern Packaging," 1950/Jan./132.)

Polyethylene-lined drums.—To facilitate use of sprayed acid-resistant polyethylene coatings, polyethylene-lined 30- and 50-gallon open-head seamless barrels are being used. They eliminate the high damage potential of ceramic and glass vessels to personnel and equipment. ("Products Finishing," 1950/May/108.)

Casein fibre.—A new curled casein fibre is now being used where the resiliency of horsehair previously had been uniquely suitable. The new "Caslen" fibre uses a thin single filament. ("Mechanical Engineering," 1949/Sep./753.)

Nylon paint brushes.—New, so-called 100 per cent. nylon paint brushes, produced by Industrial Division, The Fuller Brush Co., Hartford 2, Conn., are stated to last four times as long as bristle brushes on rough surfaces, such as concrete, brick and structural steel. Formerly the tips were considered too coarse for fine paint, but now a special sanding process is applied. (Machine and Tool Blue Book, 1950/Jan./250.)

Floor repair: A plastic material produced by Monroe Co. patches wood or concrete floors. Within one minute, patch will support a load of 50,000 lb. No special tools are needed for application. ("Bus Transport," 1950/Jan./134.)

Sintered copper impregnated with Teflon: F. P. Bowden found that impregnation of sintered copper with Teflon reduced the coefficient of friction from 0.24 to 0.05 at room temperature. Only above 250 degrees C., i.e. at 330 degrees C. the coefficient of friction rose to 0.12, when the untreated metal had a coefficient of 1.2. On cooling down, the same low coefficient as before was obtained. ("Research," 1950/Mar./147.)

Raw material requirements of the plastics industry.—S. Thiessen reports on the supply of the U.S. plastics industry with basic materials, and indicates the trend of the supply in future. ("Chemical Industries," (Philadelphia), 1949/Vol. 65/204.)

Organic glasses.—In a paper read at the glass technological conference, Munich, R. Vieweg compares the organic glasses with inorganic glasses with references to indices of refraction and dispersion, as well as to physical and mechanical properties. ("Glastechnische Berichte," 1949/Oct./353.)

Properties of phenolic plastics.—Some theoretical relationships between bending strength, impact bending strength and dielectric loss factor and the rate of etherification have been demonstrated by W. Spaeth. ("Schweiz. Archiv f. angew. Wiss, and Technik," 1950/16/28.)

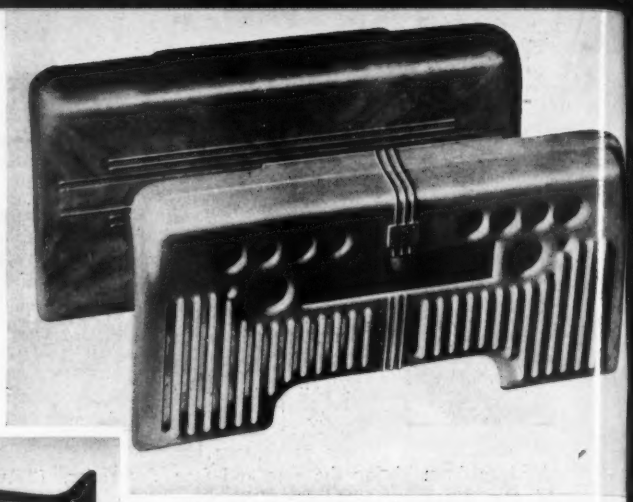
Welder-sealer.—Heating, welding, sealing and melting of polyethylene, nylon, etc., is said to be possible with one tool—a flameless electrical torch, delivering hot air or gas up to 700 degrees F. ("McGraw-Hill Digest," 1950/Feb./46.)

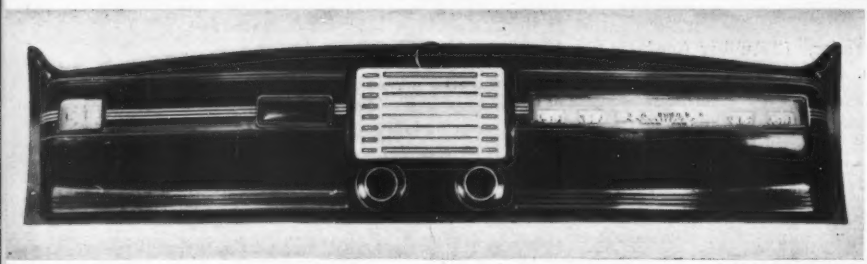
Inflammable plastics.—H. R. Fleck in a paper read before the British Fire Services Assn. drew attention to the fire risks by some plastics and their base materials, in particular referring to thermoplastics. ("Chemical Age," 1949/Dec. 3/777.)

PLASTICS
IN THE SERVICE OF MAN

A pictorial review of high-quality units moulded or otherwise fabricated in Great Britain . . .

11. Motor-car Components

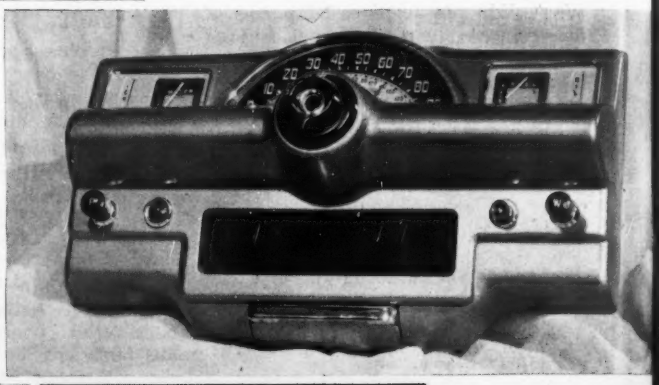


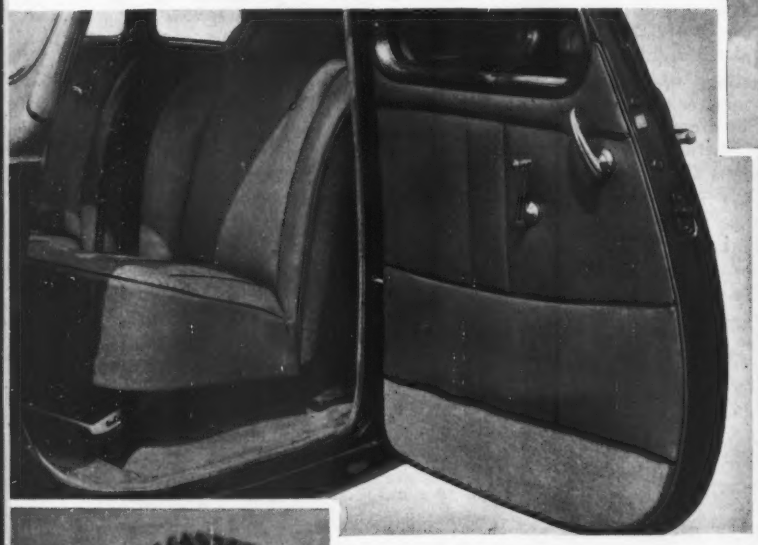


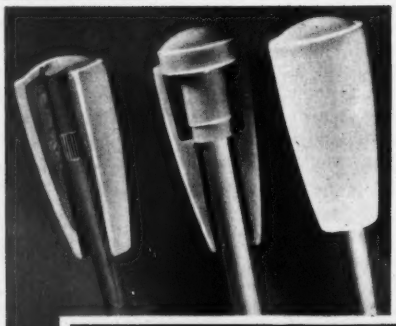
(Above) Radio grille for the Standard "Vanguard," and the dummy panel for use when no radio is fitted, are both moulded in cellulose acetate butyrate by British Moulded Plastics, Ltd.

(Above) Facia board of the Ford V8 "Pilot" car moulded in "Bakelite" phenolic material by British Moulded Plastics, Ltd. The central radio panel is a separate moulding in cellulose acetate.

(Right) Instrument panel for Humber "Hawk" car in spray-painted compression-moulded "Bakelite" phenolic housing, manufactured by British Moulded Plastics, Ltd.





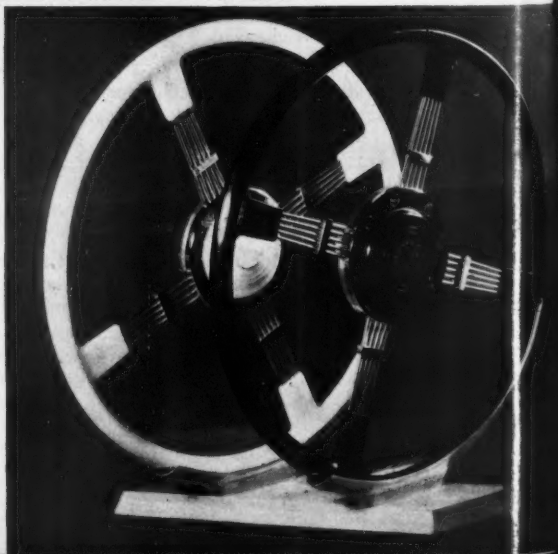


(Left) Gear-lever knobs by Plasticast Developments Ltd., showing alternative methods of construction: (left) die-cast aluminium alloy core sheathed with cellulose acetate; (centre) two-part moulding in cellulose acetate with steel shaft moulded in position in cap portion; (right) external view.

(Above) Cloth-backed p.v.c. leathercloth is increasingly replacing real hide in the interior fittings of motor cars. Good appearance, washability and hard wear are some of the qualities which make these materials popular, whilst their economic price enables car manufacturers to quote lower prices for leathercloth upholstered cars. The seat and door panel shown above are covered in "Everflex," manufactured by Bernard Wardle and Co., Ltd.

(Right) Brooklands steering wheels manufactured by Bluemel Bros., Ltd. have cellulose acetate rims moulded over a steel core. This display was seen at the B.I.F. stand of Courtaulds Ltd., manufacturers of cellulose acetate moulding powders.

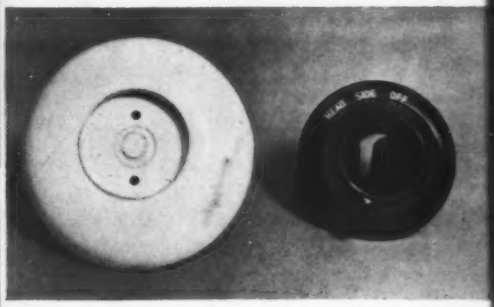
(Left) Cam timing wheel for Morris Motors, Ltd., in "Texolex" fabric-reinforced moulding material, manufactured by The Bushing Co., Ltd.



(Left) The curved motorcycle windshield of "Perspex" acrylic sheet, manufactured by Feridax, Ltd., gives good protection without impairing visibility.

(Below) Formed "Perspex" is also used for the motorcycle "handshield" manufactured by Graham Motor Productions, Ltd.

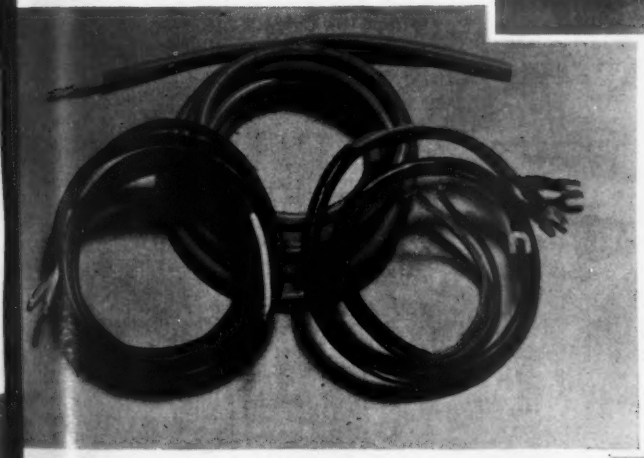
(Above) Nameplate for Carrimore Six Wheelers, Ltd., injection-moulded in cellulose acetate, and (inset) gear-lever knob in cellulose acetate butyrate for Austin Motor Co., Ltd., both moulded by Fraser and Glass, Ltd.

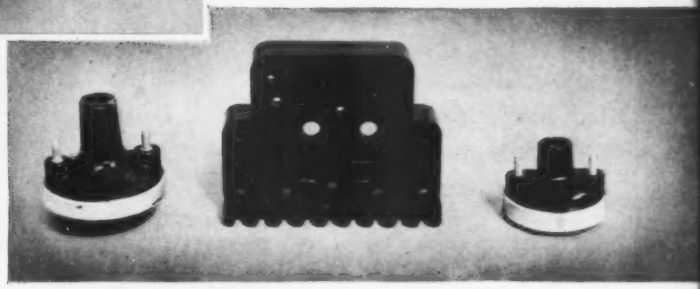


(Right) "Day-Nite" mirror, with bracket and arm sheathed in black cellulose acetate, manufactured by E. W. Puckert, Ltd.

(Below) Special colouring has been incorporated in these p.v.c.-covered leads manufactured by Duratube and Wire, Ltd. for the motor industry.

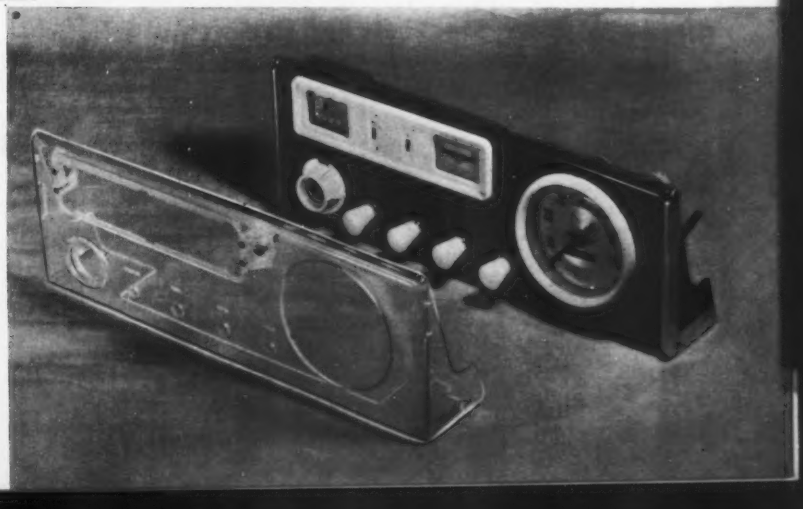
(Above) Mouldings used in the electrical system of motor cars include a control cover in urea, light switch knob in phenolics, and (below) a regulator base and two coil tops in phenolics, all moulded by Joseph Lucas (Batteries), Ltd.





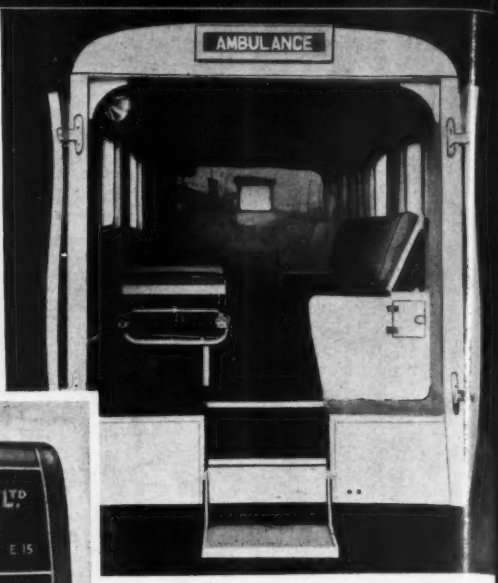
(Below) The dash-board for the Hillman "Minx" car, made by Clearex Products Manufacturing Co., is fabricated from clear "Perspex" acrylic sheet and finished by spraying on the reverse to give a dark, lustrous appearance.

(Below) Extruded p.v.c. finds many uses in the motor industry, including windscreen-wiper tubing, pressure tubing, insulating sleeving, draught excluders and wing piping, all manufactured by Tenaplas, Ltd.



(Left) The "Land Rover" car — in the "Jeep" tradition—makes use of "Perspex" acrylic sheets for its side windows.

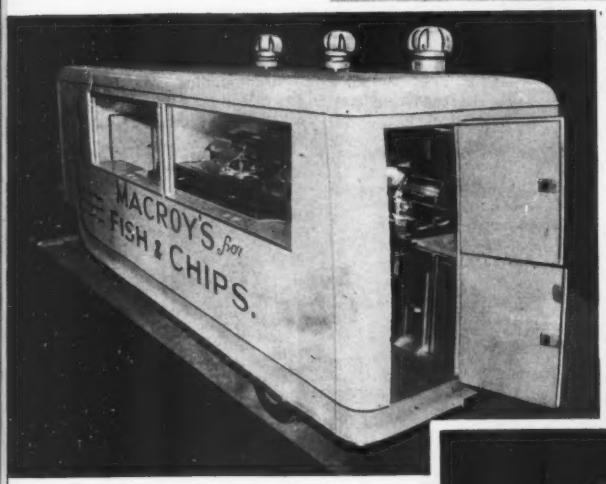
(Right) Another interesting use for "Perspex" is in the lining of ambulances. Ashdowns, Ltd., fabricated the cream "Perspex" facings on the partition, sides, doors and roof of this ambulance by Rootes, Ltd.

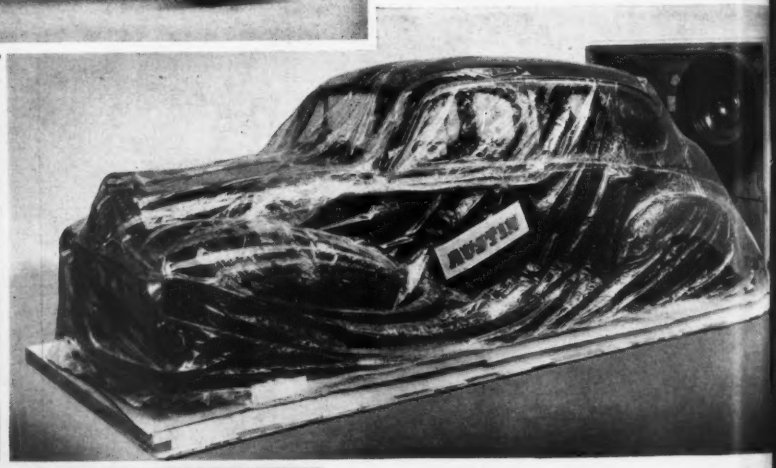


(Right) "Holoplast" laminated panelling is used in the construction of the delivery van of J. Gliksten and Son, Ltd. Built by The Cunard Commercial Body Building Co. on a Morris Commercial chassis. ("Plastics," 1948/581.)

(Below) Cars exported by the Austin Motor Co. Ltd. are now protected by complete wrapping in "Alkathene" polythene film (Imperial Chemical Industries Ltd.), the joints being sealed by a low-temperature bonding process.

(Below) The entire lining of this mobile fish-and-chips shop, built by R. A. Dyson and Co. Ltd. is in blue-grey marbled "Formica." ("Plastics," 1948/580.)

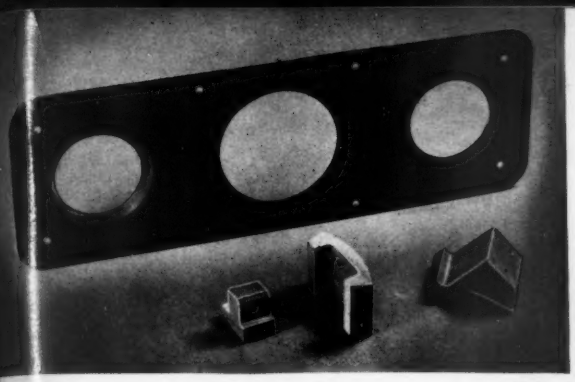




(Right) The curved rear corner windows of "Perspex" acrylic sheet on the coach-built cab of the Mark III Tractor Unit by Proctor Springwood Ltd. give direct view of both sides of the body or trailer. ("Plastics," 1948/580.)

(Below) London's "Crossing Patrols" carry signs made by Thomas De La Rue and Co. Ltd., using the interlaminate printing technique on "Traffolyte."

(Left) Specially moulded p.v.c. strips are used for "Lifeline" and "Flareline" road-marking units, manufactured by The Phoenix Rubber Co. Ltd. for Industrial Chemicals Ltd. The "Flareline" unit (inset) also incorporates small glass reflectors. ("Plastics," 1950/March/79.)



(Above) The black paper-base laminate instrument panel and fabric laminate packing blocks are fabricated for the motor industry by Insulation Equipments, Ltd.

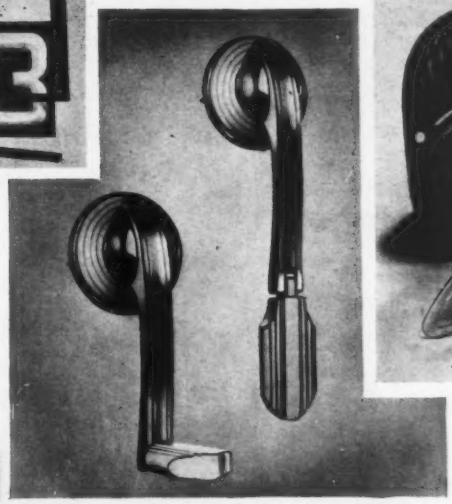
(Below) White, translucent moulded characters are used in the Ace "Registrator" number plates manufactured by Cornercroft, Ltd.

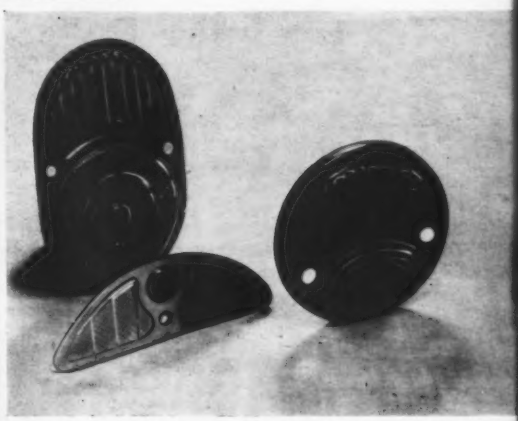
(Right) Window regulator handle for the Standard "Vanguard" car, with escutcheon and hinged handle grip moulded in cellulose acetate butyrate, manufactured by Wilmot Breeden, Ltd.

(Below) Mouldings for new "Ekco" car radio, including speaker cabinet and fret, tuning scale, escutcheon and control knob, moulded in various plastic materials by E. K. Cole, Ltd.

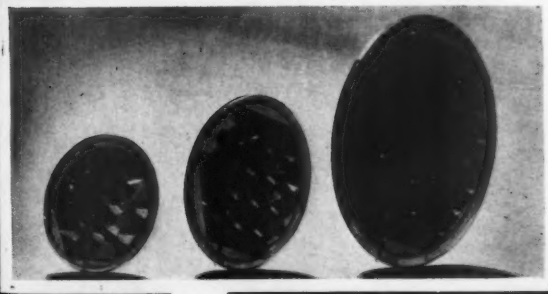
(Below) Distributor base with brass insert, battery vent plug and two control knobs, moulded by Crystalate, Ltd.

(Above) The large coach-lamp frame, urea roof lamp lens with phenolic frame, licence-holder back plate and ash-tray cover are all moulded by Crystalate, Ltd.



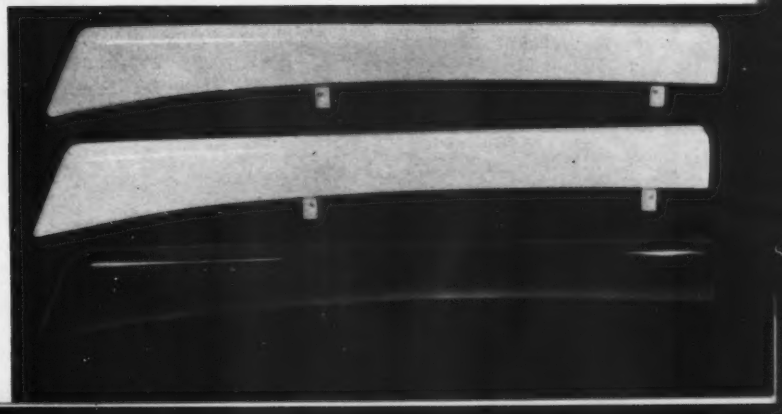


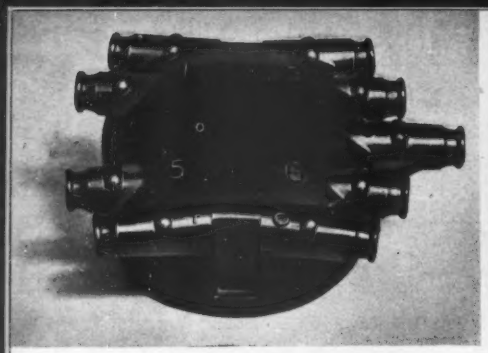
(Above) Various rear-light lenses formed from celluloid sheet by the General Celluloid Co., Ltd.



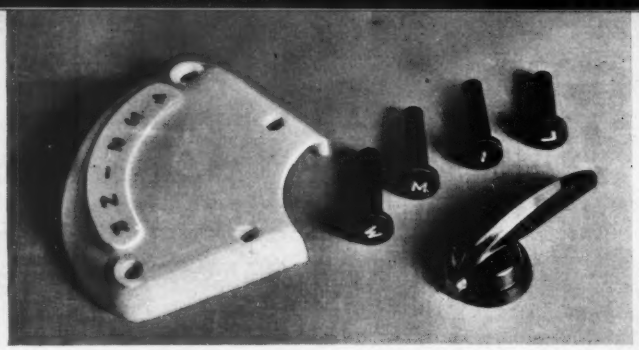
(Left) Prismatic reflector lenses for use on rear lights, moulded in polystyrene by Fairylites, Ltd.

(Below) "Perspex" window-cappings for motor cars, manufactured by Armstrong Siddeley Motors, Ltd. (Photo: I.C.I., Ltd.)



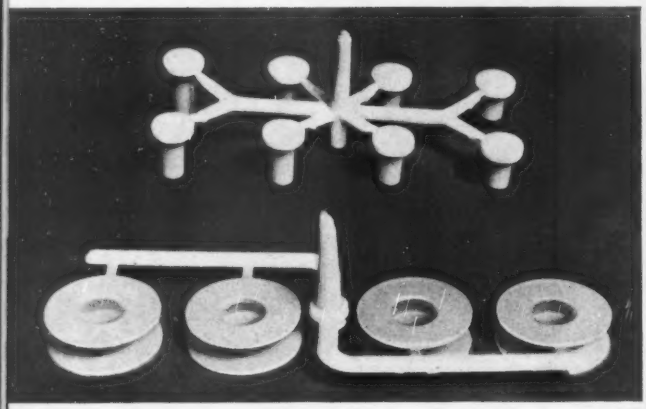


(Above) Distributor cover moulding in black phenolic material, manufactured by Joseph Lucas (Batteries), Ltd.

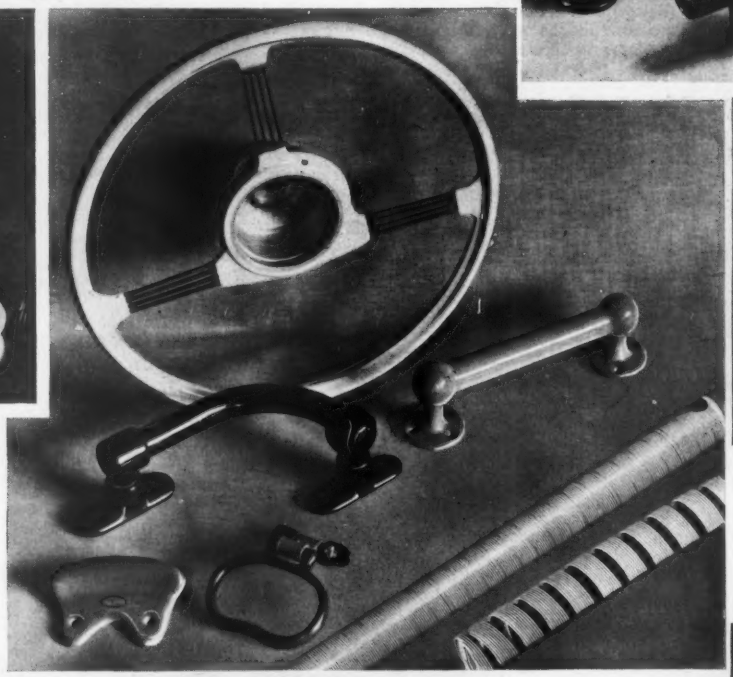


(Left) Gear control housing covers for Armstrong Siddeley cars, control knobs for Rolls-Royce cars and trafficator switch handles for Jowett cars are moulded by Universal Metal Products, Ltd.

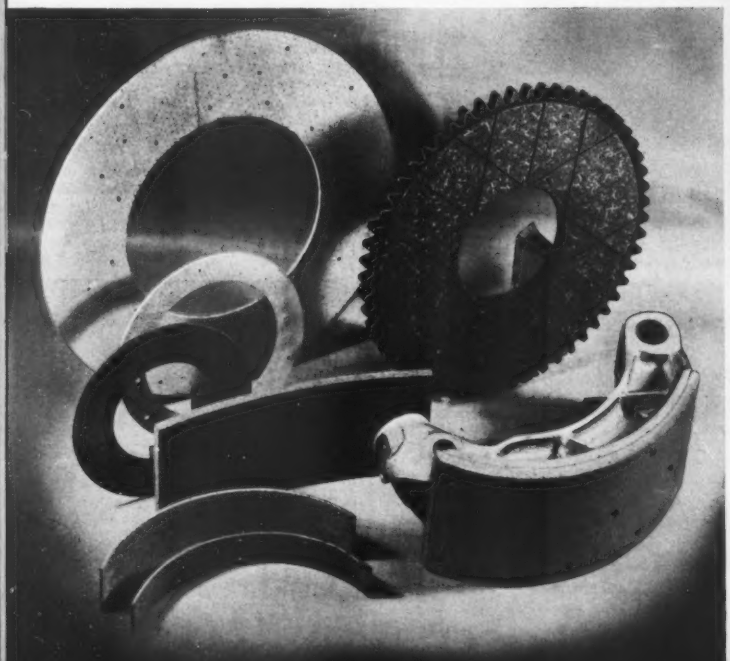
(Left) Windscreen-wiper commutators, combining the use of nylon mouldings and phenolic materials, manufactured by Joseph Lucas (Batteries), Ltd.

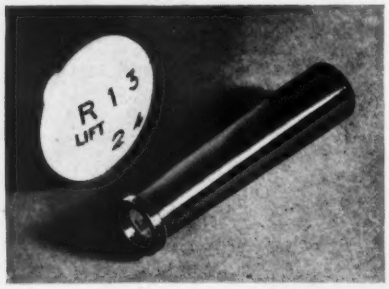


(Above) Control knobs in cellulose acetate butyrate and nylon coil formers, injection-moulded by Joseph Lucas (Batteries), Ltd., are seen still attached to their moulding sprues.



(Below) Clutch discs and brake linings manufactured from woven and moulded cresol-formaldehyde-bonded friction materials by Hubert H. P. Trist and Co., Ltd.

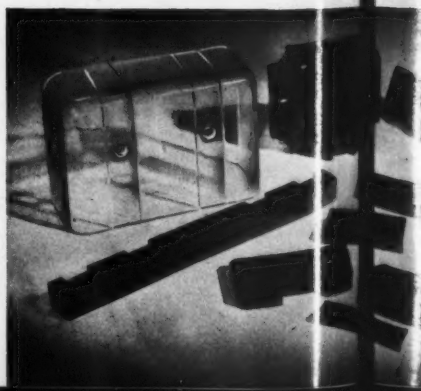


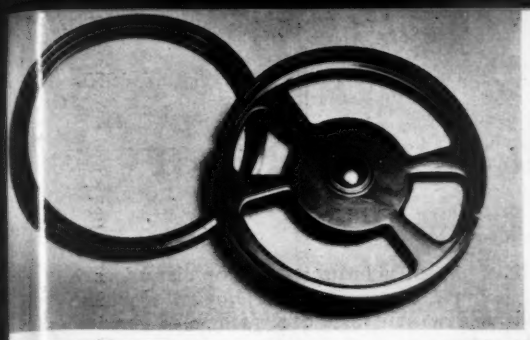


(Above) Steering-wheel rim, rails and handles covered in "Doverite" plastic material; the rail in the foreground is covered with a spirally wound cellulose acetate extrusion, manufactured by Dover, Ltd.

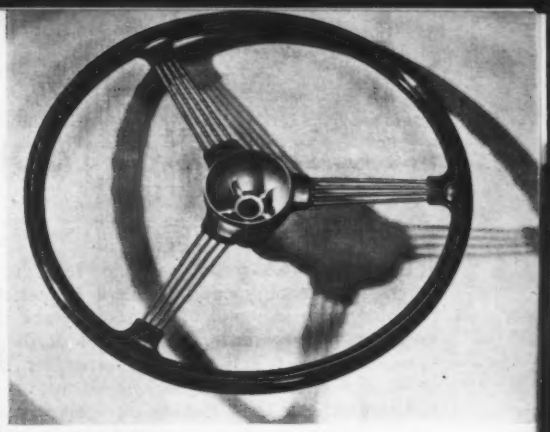
(Above) Compression-moulded gear lever control knob with brass insert, and brake handle, manufactured by W. H. Tant and Co., Ltd.

(Right) Mouldings for motor electrical systems manufactured by E. K. Cole, Ltd. (Plastics Division) for C.A.V. Ltd.

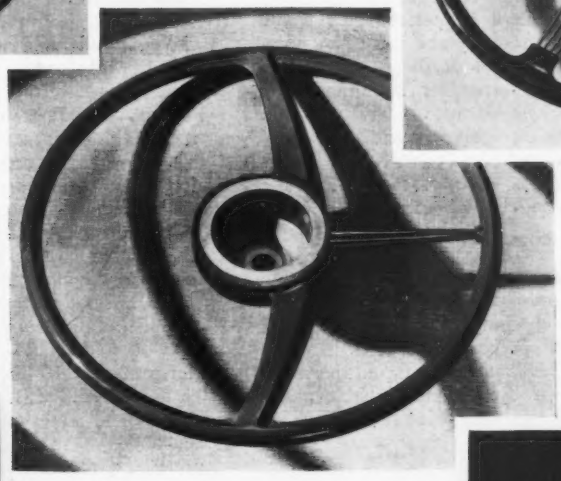




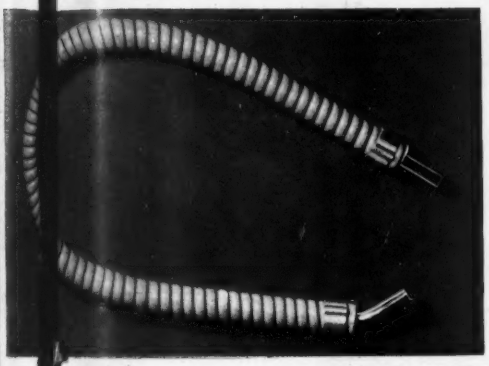
(Left) Speedometer retainer ring and mask moulding for instrument gauge frame, moulded in phenolics for A.C. Sphinx Spark Plug Co. (Division of General Motors, Ltd.) by Litholite Insulators and St. Albans Mouldings, Ltd.



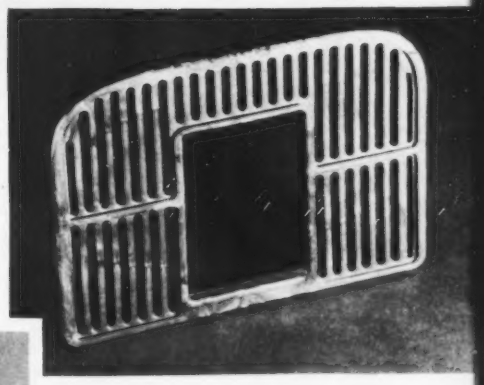
(Left) Four weather-proof terminals moulded in phenolics for Lodge Plugs, Ltd., by Litholite Insulators and St. Albans Mouldings, Ltd.



(Above) Austin steering wheel with rim injection moulded in mottled brown cellulose acetate butyrate; and (left) Humber steering wheel, with rim, main spokes and hub covered in beige cellulose acetate butyrate by compression-moulding, manufactured by Wilmot-Breeden, Ltd.

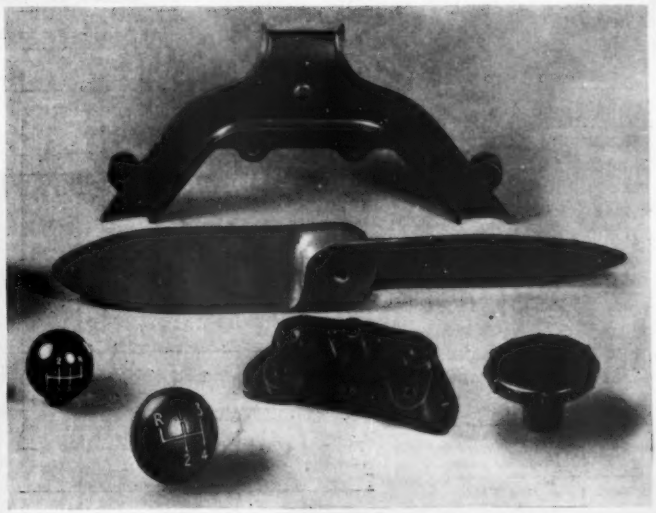


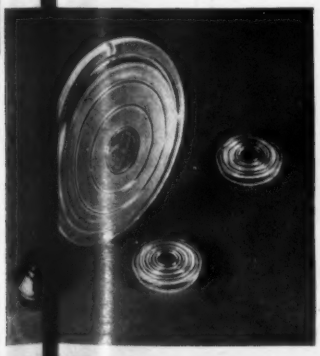
(Left) "Flexatex" thick-walled plastic tubing with brass end fittings as fitted to Daimler cars, manufactured by Wilkinson Rubber Linatex, Ltd.



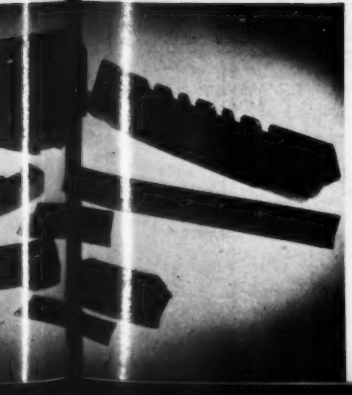
(Above) Radio grille, injection moulded in cellulose acetate, with four brass screw inserts, made by Injection Moulders, Ltd., for Wilmot-Breeden, Ltd.

(Bel[illegible]) Car lenses in red and clear p[illegible]rene, moulded for L. E. Perei A[illegible]evices, Ltd., by J. F. Kenure, Ltd.

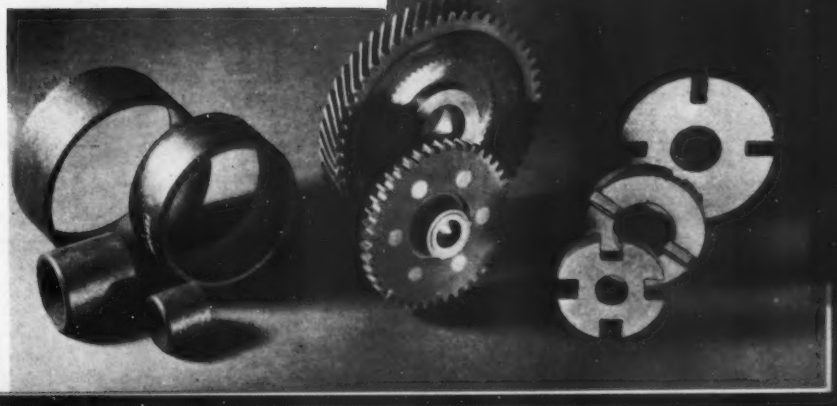




(Below) Plain and graphited bushes, timing wheels and coupling discs, manufactured by Ferodo, Ltd., from "Ferobestos" resin-bonded laminated asbestos material.



(Above) Fan blades, gear lever knobs, and other mouldings for the motor industry, manufactured by Frederick W. Evans, Ltd.



Phenolic Mouldings with Nylon Filler

By E. E. HALLS

FOR nearly 30 years phenolic resin mouldings have gradually established a standard of performance where reliability is an essential. Their stability and inertness signify retention of appearance, maintenance of shape and dimensions, and good resistance to variations in atmospheric conditions, including changes from warm to cold, dry to wet, and vice versa. Their mechanical properties are quite high, electrical characteristics good, and they exhibit good resistance to a wide range of chemicals. These facts proclaim the general-purpose nature of phenolic resin mouldings, and explain why their adoption is not largely confined to a single industry.

The raw material for producing these mouldings consists of a thermosetting phenolic resin compounded with appropriate filler, by varying which the properties of the moulding can be modified. For general purposes, the filler is wood flour. When greater rigidity, resistance to heat and moisture, and very close permanence of dimensions under extreme conditions of usage, involving relatively wide fluctuations of temperature and humidity are required, a mineral filler either partly or completely replaces the wood flour. If resistance to the shock of impact stresses is needed, a flock filled material is selected, namely, one in which chopped cotton or fabric is substituted for the wood flour.

Numerous grades in these categories of moulding powder have been available for many years. These have served practically all sections of industry, as well as the packaging and novelty trades. At the same time, the ideal is never achieved, and there is always room for development to evolve new materials which may enable greater efficiency to be achieved by replacing older materials in a few applications, but which may create new uses by fulfilling requirements that could not previously be satisfied. Nylon filled phenolic resin moulding powders represent such a material. They were available in restricted quantity several years ago, and their advantages and limitations are not yet fully appreciated by industry in general.

The simple wood flour filled phenolic powders are the easiest to mould and therefore the most economic to employ when the product satisfies the requirements demanded from it. The flock filled types are a little more difficult, not only on account of their greater bulk, but also on account of a tendency for the filler to be baffled and therefore "filtered" from the resin in complex moulds. This restricts their use and often makes it impossible to produce mouldings having abrupt changes of section, very small components, or those which are of intricate design.

The mineral filled types are rather more difficult to mould, they may be abrasive on the tools, and in thin sections may be rather brittle. When ultimate stability of dimensions is essential, for example, for service under tropical conditions where considerable warmth and condensation of moisture must be withstood, a mica filled moulding having from 50 to 60 per cent. of the filler has been successfully employed. Further, mouldings in this material resist mould growth, which is an important attribute in electrical mouldings. For this reason, this class of material was insisted upon for electrical and instrument mouldings by the Service departments during the war.

The situation was something of a setback, not only because of increased cost and smaller outputs, but the increase in density of the mouldings was sometimes a disadvantage; some designs did not possess adequate strength, others could not be moulded at all because of thinness of section.

Nylon filled moulding powders, however, overcame these shortcomings. Unlike the wood and cotton filled mouldings, the nylon types resist mould growth. They exhibit excellent resistance to water and retain their high electrical properties well under damp conditions. Compared with other phenolic mouldings, they are more resilient and offer good resistance to impact shock. Thus impact strength is at least equal to that of the ground cotton filled grades, and more than twice that of the wood filled material.

Nylon itself is thermoplastic, and there is no evidence of the chopped nylon yarn (used as filler) in the final moulded article. In effect, the phenolic resin is "filled" with another resin which acts as a plasticizer. This results in one shortcoming, namely, a reduced resistance to heat, which is revealed by greater plastic flow under compression and temperature compared with wood, cotton flock and mineral

Table 1.

Condition	Nylon filled moulding "A"	Nylon filled moulding "B"	Wood filled moulding (electrical grade)
	megohms	megohms	megohms
As moulded	infinity	infinity	infinity
8 hours water immersion ..	100,000	15,000	6,500
24 hours water immersion	100,000	15,000	1,500

Table 2.—General Characteristics of Phenolic Mouldings.

	Nylon Filler	Nylon and Wood Filler	Wood Filler	Mineral Filler
Acetone soluble matter, %	7.5	6.5	7.2	5.1
Ash on incineration, %	0.92	1.48	1.74	59.8
Water absorption (24 hours), % ..	0.04	0.06	0.30	0.08
Loss in weight on heating (24 hours at 110°C.), %	0.47	0.94	1.10	0.35
Sp. Gr. at 25°C.	1.20	1.24	1.33	1.79

Table 3.—Phenolic Mouldings under Dry Heat Test at 110°C. + 1°C.

Period of Heat Test (days)		Decrease in weight or dimensions (per cent.)			
		Nylon Filler	Nylon and Wood Filler	Wood Filler	Mineral Filler
1	weight	0.5	1.0	1.2	0.3
	length	0.2	0.2	0.4	0.2
	width	0.2	0.2	0.5	nil
	thickness	nil	nil	0.2	0.1
7	weight	1.2	2.0	2.9	1.7
	length	0.4	0.5	0.6	0.5
	width	0.4	0.5	0.7	0.1
	thickness	0.4	0.5	0.7	0.3
21	weight	1.8	2.5	3.6	1.9
	length	0.5	0.6	0.7	0.7
	width	0.5	0.6	0.8	0.3
	thickness	0.4	0.7	1.0	0.4

Table 4.—Phenolic Mouldings under Water Immersion Tests at 20 to 25°C.

Period of Water Immersion (days)		Increase in weight or dimension (per cent.)			
		Nylon Filler	Nylon and Wood Filler	Wood Filler	Mineral Filler
1	weight	0.02	0.05	0.05	0.08
	length	nil	nil	nil	nil
	width	nil	nil	nil	nil
	thickness	nil	nil	nil	nil
7	weight	0.07	0.17	0.95	0.30
	length	nil	0.05	0.10	nil
	width	nil	nil	0.08	nil
	thickness	nil	nil	0.20	nil
21	weight	0.25	0.55	3.0	0.45
	length	0.05	0.20	0.40	nil
	width	0.05	0.15	0.40	nil
	thickness	nil	nil	0.50	nil

Table 5.—Phenolic Mouldings under Mild Cyclic Humidity Test.

Period of Humidity Test (days)		Increase in weight and dimensions (per cent.)			
		Nylon Filler	Nylon and Wood Filler	Wood Filler	Mineral Filler
1	weight	0.01	0.03	0.08	nil
	length	nil	nil	nil	nil
	width	nil	nil	nil	nil
	thickness	nil	nil	nil	nil
7	weight	0.05	0.12	0.35	nil
	length	nil	nil	0.15	nil
	width	nil	nil	0.12	nil
	thickness	nil	nil	0.80	nil
21	weight	0.16	0.40	1.50	nil
	length	nil	0.05	0.35	nil
	width	nil	0.05	0.25	nil
	thickness	nil	nil	1.60	nil

Table 6.—Phenolic Mouldings under Severe Cyclic Humidity Test.

Period of Humidity Test (days)		Increase in weight and dimensions (per cent.)			
		Nylon Filler	Nylon and Wood Filler	Wood Filler	Mineral Filler
1	weight	0.10	0.15	0.80	Negligible
	length	nil	nil	0.12	"
	width	nil	nil	0.12	"
	thickness	nil	0.50	0.70	"
7	weight	0.40	0.70	4.2	Negligible
	length	nil	0.15	0.42	"
	width	nil	0.05	0.45	"
	thickness	0.40	0.50	2.50	"
21	weight	0.80	1.50	9.0	0.20
	length	0.15	0.35	1.25	0.04
	width	0.15	0.30	1.30	0.04
	thickness	0.40	0.85	7.0	0.25

loaded mouldings. Thus, plastic yield at 140 degrees C. is about twice that of wood filled mouldings, or four times that of the mica loaded types. This limitation of the nylon filled mouldings is of significance in a limited number of applications only, whereas the advantages render this grade of moulding of first consideration for many general purposes.

One of the most important uses of nylon filled phenolic mouldings is in the electrical industry, where good insulation characteristics between inserts, or closely spaced conductors, are of paramount importance under damp conditions. This is demonstrated by insulation resistance values measured at 500 volts D.C. between metal inserts at 1¼-in. centres, specimens being tested before and after immersion in distilled water at room temperature. The values given in megohms (Table 1) are typical for two grades of nylon filled and one grade of wood filled phenolic mouldings, the wood filled being the normal general purposes electrical grade.

The indication from these figures is that, not only is the insulation of nylon filled mouldings very much less influenced by moisture than is that of wood filled types, but the drop in value is not continued with prolonged exposure to water. Further, nylon types can be selected with very high insulation values under damp conditions; the inference from the test results is that the nylon samples (B) contain a mixture of nylon and wood flour.

The favourable characteristics of nylon filled mouldings are revealed by tests other than those for electrical resistivity or insulation, and some data are presented below. These are in the nature of typical average values in comparison with those obtained on wood and mineral loaded mouldings under similar conditions. Table 2 shows the usual test characteristics of the materials studied, these including phenolic resin mouldings having all-nylon filler, nylon and wood flour, wood flour only, and the best of the mineral loaded types having about 100 per cent. mica dust as loading. These were tested under conditions of dry heat, water immersion, and combinations of heat and humidity for extended periods. Performance under these conditions was assessed from changes in weight and dimensions.

Table 3 summarizes the average results showing behaviour under dry heat at 110 degrees C. Shrinkage and loss in weight occur with all samples. Performance in all cases is very good, and it rates the nylon type as equal to the mica filler and approximately twice as good as the wood filled material. The results, of course, relate only to the test conditions, i.e., the test pieces were " free " and not clamped under pressure.

Table 4 refers to complete water immersion at room temperature. Again, all results which show a tendency to increase in weight and dimensions indicate very good performance of all specimens, but the mouldings with nylon filler claim to be linked with the mineral filled ones for first place with respect to stability under these conditions.

Table 5 deals with results from less arduous test conditions, which comprise a combination of mild heat and humidity, such as might be encountered under extremes in temperate climates and where no air conditioning is provided. The daily cycle was made up from an eight-hour day period at 55 to 60 degrees C. with humidity of 60 to 80 per cent., and the 16-hour night period cooling off to room temperature (20 to 25 degrees C.), with humidity rising to 100 per cent., and resultant moisture condensation upon the specimens. Again, stability of all specimens is good, the changes being towards an increase in the factors recorded. The nylon filled samples are outstandingly good, much superior to the wood filled ones, and virtually equal to the mica loaded specimens.

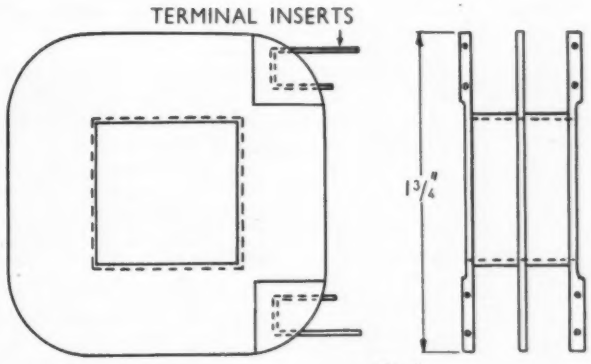


Fig. 2.

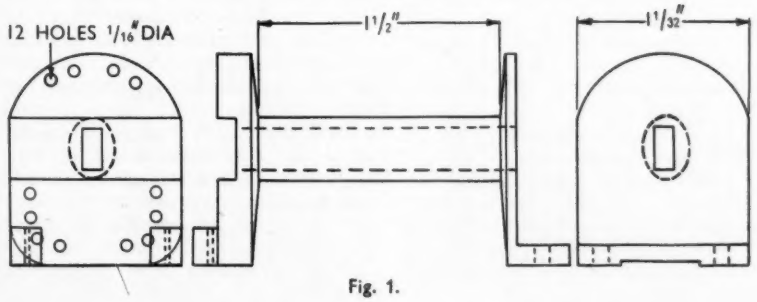


Fig. 1.

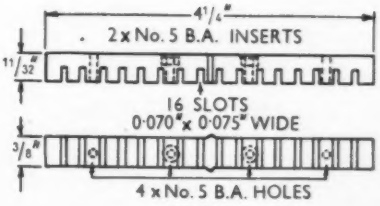


Fig. 3.

Table 6 depicts the results from a test of similar nature, but more exacting. In this the daily cycle consisted of eight hours at 60 degrees C. and 100 per cent. humidity, then cooling off to room temperature and holding in the test cabinet for the remainder of the 24 hours, i.e., maintaining the 100 per cent. humidity and with heavy condensation of moisture on the specimens. The straight nylon filled mouldings performed almost as well as the extremely stable mica loaded samples; the nylon/wood filled specimens were only a little inferior, and the wood filled mouldings appreciably poorer (in a relative sense), although all behaved very well indeed.

With the straight nylon filler, and combinations of nylon and wood flour, and nylon and mineral loading, great possibilities exist of combining the merits of the various classes, and of suppressing or eliminating the demerits. Many of the severe requirements of the electrical industry can be satisfied. Mouldings of contrasting section and thin section can more easily be produced; those in which thin sections are subjected to tensile and compressive strains can give superior performance without failing from cracking; inserts with small surrounds can more safely be moulded in position without risk of cracks developing during the post-moulding contraction; impact stresses can generally be better withstood. These are some of the practical advantages of nylon filled mouldings.

Fig. 1 shows diagrammatically a thin-cheeked coil bobbin representing a difficult problem for phenolic resin moulding. In any formulation other than the nylon filled types, this moulding is difficult to eject from the tool without fracture of the cheeks, and impossible to wind with its coil without fracture due to the lateral pressure of the winding.

Fig. 2 shows another type of coil spool in which losses of coils due to fracture of the cheeks after winding are always high when wood filled phenolic mouldings are employed; the use of nylon filled material can eliminate this trouble. The cheek thickness for this multi-section coil bobbin is 0.05 in.

Fig. 3 shows a different kind of application, namely, an insulating strip for an assemblage of springs. Here the nylon filling solves the problem of loss of electrical insulation under conditions of high humidity, such as may occur with a sharp temperature fall at night, when condensation of moisture can occur. Apart from inefficient performance due to loss of insulation under damp conditions, in assemblies of this type (when using wood filled phenolics) destructive breakdown by electrolysis can rapidly occur if D.C. current is involved, and this breakdown occurs rapidly on account of the higher leakage current at high humidities. The nylon filler, however, can alleviate this trouble considerably.

Nylon filled moulding powders are more readily available to-day, and this gives engineers the opportunity to design components for their adoption, as also to improve the performance of some existing components by replacing materials already employed. Containers for pastes and liquids, e.g., pharmaceutical and cosmetic products, are apt for review in this connection due to lessened effect of water and liquids; bottle caps in relation to better resistance to tensile, compressive, and impact stresses.

LETTERS TO THE EDITOR

Correspondents are reminded that a stamped and addressed envelope should be enclosed in all cases where a personal answer is desired. It is understood that any letter received may be published at the discretion of the Editor.

Letters and Numerals

SIR,—We have received an inquiry from Australia for plastic letters, the colour to be red or orange. Prior to the war these were obtainable in founts, i.e., a balanced number of letters of the alphabet and a certain proportion of numerals. The sample which has been submitted to us appears to be pressed in a shallow-plate mould using cellulose acetate sheet stock, but we do not manufacture this particular type of letter. We shall be glad if you can assist us to locate a source of supply.

THE ORALITE CO., LTD.
Thornton, Blackpool, Lancs.

Scrap Plastics—Welding Machines

SIR,—As constant users of "Crinothene" for lamp-shade making, we have now accumulated a great deal of scrap. Could you advise as to what use this can be made, or as to whether there are firms that reclaim this material in any way.

Would you please advise also on firms producing welding machines for plastic adhesion?

W. G. MADDOX.
89, Great Stone Road,
Northfield, Birmingham, 31.

Moulds for Plaster Casting

SIR,—I have been searching for some considerable time for a material to make moulds suitable for casting plaster models, etc. I have used with some success "Welvic" p.v.c. paste made by I.C.I., Ltd., and wonder if you could suggest other suitable materials for making moulds which would have a Shore hardness between 15 and 25.

I am also looking for cold pouring synthetic resins and would be glad if you could suggest where this may be obtained.

Birmingham. P.C.

Sun Glasses

SIR,—We are trying to find on behalf of one of our New Zealand clients, a manufacturer of a cheap type of sun glasses, known as Barter or Bartex, and shall be glad if you will give us the name and address of the manufacturer of these plastic sun glasses.

E. W. CARLING AND CO., LTD.
5, Laurence Pountney Hill, E.C.4.

Plastic Rod—Marking Means

SIR,—I am working on an idea for a new line which I want to be produced in plastic and shall be glad if you will kindly pass my requirements to suitable firms to quote me for quantities of $\frac{5}{16}$-in. or $\frac{3}{8}$-in. hexagonal plastic rod in black and in white, this rod to be drilled through the centre to take a smaller round plastic rod which must revolve freely.

These two types of plastic rod are to be in convenient lengths. When ready for use they will be cut up and each side of the hexagon numbered. Therefore, I also wish to know of any firm in the plastics trade which is in a position to suggest a cheap method of imprinting these numbers on the sides.

E. J. WILLIAMS.
3, St. Luke's Road,
Bournemouth.

Stearates

Sir,—We are requiring stearates, and should be pleased if you could kindly give us the address of a firm that manufactures them.

WOOD AND METAL INDUSTRIES, LTD.
Seymour Road,
Leyton, E.10.

[EDITOR'S NOTE: Lead stearate is manufactured by Associated Lead Manufacturers, Ltd., 14, Finsbury Circus, E.C.2 Other metallic stearates and plasticizers made from stearic acid are produced by A. Boake Roberts and Co., Ltd., Carpenters Road, E.15; Howards and Sons, Ltd., Ilford, Essex; British Industrial Solvents, Ltd., 4, Cavendish Square, W.1.]

"Pimo" Machine

Sir,—In your issue of "Plastics" for June (page 154) you briefly described our "Pimo" machine for the inserting of metal reinforcements into acetate spectacle frames. We would be greatly obliged if you would mention that this process is the subject of British Patent 633,201.

OPTOPLAST MANUFACTURING CO., LTD.
Millmead,
Guildford, Surrey.

An Exhibition of "Celanese" Plastics

PROGRESS in the application of "Celanese" plastics to various trades and industries was the theme of a special exhibition held recently by British Celanese, Ltd., at Celanese House, Hanover Square, London, W.1. Since the last display, which was smaller but of a similar character, many new applications have been developed. Of these, some have already been adopted in industry on a commercial basis; others are at a point where experiments are now being finalized by various industries before production is begun on a large scale.

The range of "Celanese" plastics, which comes within the cellulose acetate group, comprises "Celastoid" sheeting (including optical quality), tubing, rods, sections and moulding powders; "Clarifoil" transparent film; and "Cinemoid" special non-inflammable sheeting.

Examples of uses to which "Celastoid" sheeting can be applied include all types of novelty packs and containers; protective shields for miners' hats; anti-glare shields for welders; accessories for the motorcar industry; advertising and display units; radio and gauge dials; lampshades; diffusers for concealed lighting; aircraft component parts; machine guards, etc.

In the field of usage for "Celastoid" extrusions notable progress has been made in the use of tubing, available in diameters of ¼-in. upwards, both as a covering over metal and wood, and without reinforcement. In conjunction with Porter London Products, Ltd., Albany Street, N.W.1, barrier rails covered with "Celastoid" tubing incorporating a patented special expander joint have been installed in various stores and cafeterias, and by public transport companies. Tubular steel furniture and equipment have also been successfully covered with this type of extrusion; the present display includes chairs, tables, bar stools, hospital trolleys, bed tables, and rollers used in textile machinery. A point of interest is that this extruded tubing conforms to the L.C.C. Fire Regulations.

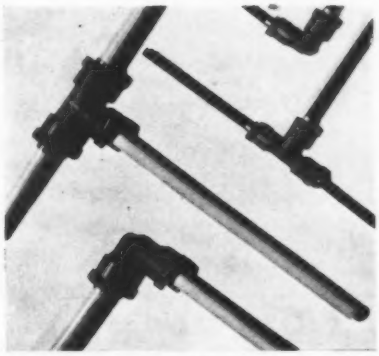
A special coupling, introduced by High Pressure Components, Ltd., 1a, Grosvenor Gardens, S.W.1, facilitates the use of "Celastoid" extruded tubing. This "Gyp" coupling is suitable for almost any conditions of pressure, vibration and pulsation which the extruded tubing is likely to have to withstand, and has the interesting feature that the joint may be broken and remade any number of times without impairing efficiency. The patented split collet also automatically takes up any slight tolerances in the tube diameter. The couplings are available in various metals and alloys to suit the particular purposes for which they are required, and when used in combination with "Celastoid" tubing they provide a leak-proof joint, thus enabling the construction of pipe systems for conveying powdered products.

"Clarifoil," with its crystal clarity, versatility, toughness and flexibility, is a particularly useful medium for "vision" packaging; it can be used as a complete wrapping, as an over-wrap, or in boxes with windows. A large and varied selection of such packs was shown in the present display. A new high-frequency welder, by Redifon, Ltd., Broomhill Road, Wandsworth, S.W.18, engaged in making transparent boxes from "Clarifoil" blanks, provided a practical demonstration of the speed and ease with which these packs can be made. An illustration of this welder was given in the June issue of "Plastics" (page 173).

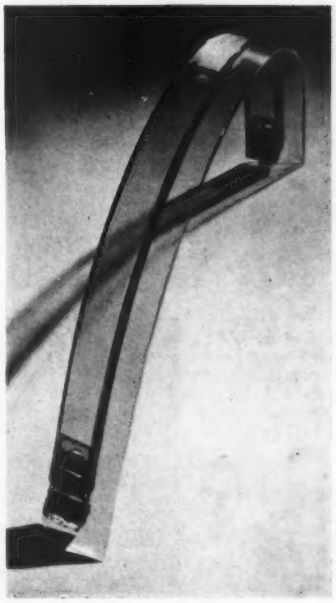
This transparent film can also be used in other ways; one of its more interesting applications is in the "Emitape" magnetic sound recording tape, which is supplied to the B.B.C. The film has a surface suitable for multi-colour printing. It can be laminated to paper, metal foil and board, to produce an entirely new range of packaging materials.

The spiral-winding of "Clarifoil" opens up very wide possibilities in the packaging field. It can be produced in a variety of sizes and a variety of cross-sections (circular, square, elliptical), or it can be flattened to form envelopes and bags. We refer elsewhere in this issue (page 201) to a new machine which has been developed by R.B.K., Ltd., 23, King's Road, Sloane Square, S.W.3, for the spiral winding of "Clarifoil"—another working demonstration which was seen at this exhibition.

"Clarifoil" film coated with iron oxide is used for this magnetic sound recording tape as supplied to the B.B.C. and overseas broadcasting companies by E.M.I. Factories, Ltd.



"Gyp" coupling for "Celastoid" extruded tubing, by High Pressure Components, Ltd.



(Above) Doll's head formed by blowing "Celastoid" sheeting, as made in the Plastic Development Workshops of British Celanese, Ltd.

(Left) This silica-gel container for the canopy of a jet fighter is made from "Celastoid" sheeting by Triplex Safety Glass Co., Ltd.

New Productions in Plastics

Toy Boat

This realistic toy paddle-wheel steamer is injection moulded in polystyrene in three colours by Poplar Plastics, New Street, Trading Estate, Bridgend, Glamorgan. The simple, clean lines of this moulding are particularly notable; they convey a true idea of all the essential features of such a boat, without "frills." Some other productions by this company were illustrated in "Plastics," March, 1950 (page 78).

Cup of Novel Design

This cup, as seen from our illustration, has a most unusual shape. It has been specially designed for the use of invalids and children. In the case of invalids, the head need not be raised from the pillow; used thus, the flow of liquid from cup to mouth is easily kept under control, for the level of the liquid is visible. Children, too, can drain every drop without tilting the head. The elliptical rim equally well provides controlled flow for the small mouth of a child, and while in the act of drinking the rim of the cup always remains clear of the forehead. Obtainable in a range of colours—pink, blue, peach, green, cream and white—this cup (Regd. Design No. 855,945) is moulded by Insulators, Ltd., for Martin Russell, Ltd., 143, Cannon Street, London, E.C.4. The mould is constructed on a two impression unit basis which, owing to the inclined flash surfaces, are opposed to one another in order to equalize or balance the landing areas. The handle core pieces are withdrawn automatically by dowels, and the moulding of the components is reduced to a very simple cycle. The cup is moulded (for export only) in melamine.

Toy Television

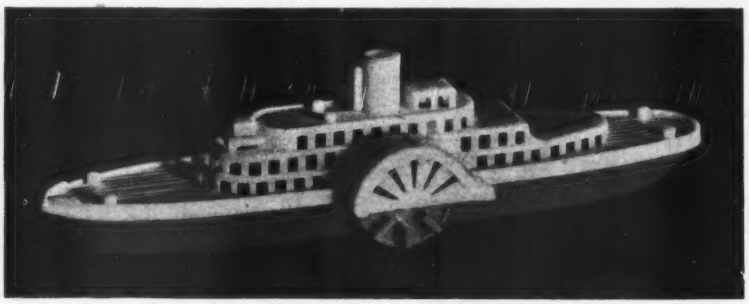
This very amusing toy, produced by E.V.B. Plastics, Ltd., Brighton Road, Salfords, Surrey, as one of their range of "Beeju" plastic toys, is moulded in red and white cellulose acetate. It has a simple internal system of rollers to feed the film and is lighted by a pocket lamp bulb and 4½-volt battery. The body of the cabinet is moulded in two parts and cemented together; including the key, rollers, screen, etc., there are seven additional plastic pieces.

Domestic Ware

New designs in table and picnic ware by P. B. Cow and Co., Ltd., London Moulders Department, 12, Hay Hill, Berkeley Square, London, W.1, include a butter dish of polystyrene, with urea plate and cover, a holder (complete with lid) to fit over and suitably disguise the common glass jar in which jam and similar products come to the consumer, and an unbreakable polythene beaker—all of which are seen in one of the illustrations on this page.

Implosion Guards

An interesting development in television is the production of "implosion guards," which are made of a special neutral-tinted "Perspex" acrylic sheet. The neutral tint increases contrast, prevents glare, and enables viewing to take place in daylight or strong artificial light just as efficiently as in the dark. Although slightly more expensive than toughened glass, the acrylic implosion guard offers the great advantage of daylight viewing. Great interest is being shown in this development by the British television industry, which is ahead of its American competitors in this direction. Several tints are being made to match the different characteristics of the various cathode-ray tubes which are on the market.

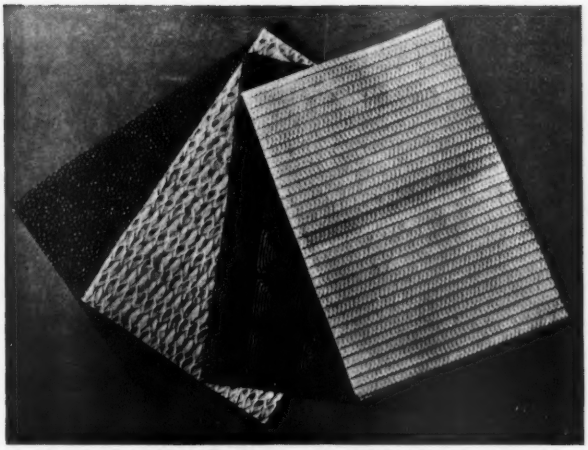


Toy paddle-wheel steamer (polystyrene).

Toy television (cellulose acetate).

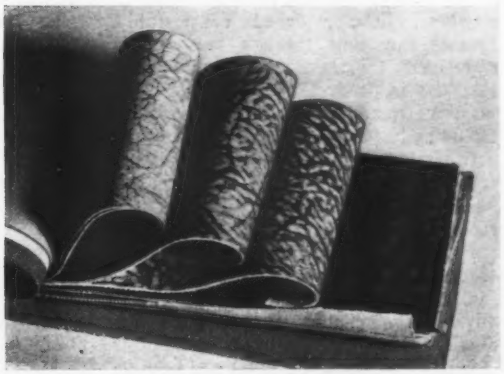
(Left and above) Cup of novel design for invalid's use (melamine).

(Right) Household ware (polystyrene, urea and polythene).

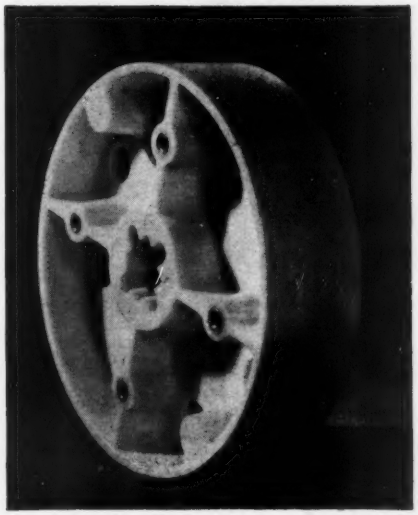


New designs in embossed P.V.C.

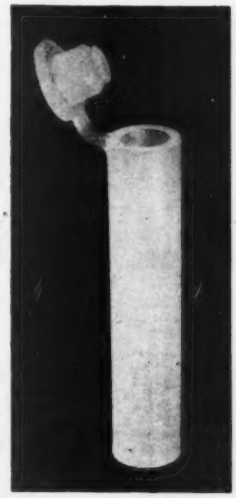
Toys for playing with sand (cellulose acetate).



"Zapide" vinyl-coated fabric.

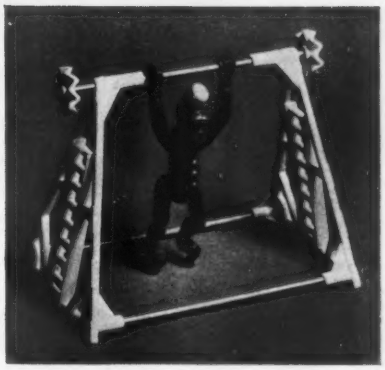


Hub for spool ("Bakelite" urea).



(Left) Pencil refill container (polythene).

(Below) New toy (cellulose acetate).



Educational plaything (urea).

P.V.C. Embossings

One of our illustrations shows some of the new designs in embossed p.v.c., which were shown for the first time at the 1950 B.I.F. by Duraplex (Plastics), Ltd., 14, Caxton Street, London, S.W.1. This company, which specializes in p.v.c. sheeting in calf, pinseal, reptile and fancy embossings, had some 60 new designs on show, and gave customers an exclusive choice of any new design where that could be mutually arranged.

Hub for Spool

The hub used on the 15-in. diameter "Premier" spool manufactured by Robert Rigby, Ltd., is moulded in "Bakelite" urea material by Case Development Co., Ltd. The centre of the hub is designed to take interchangeable sleeves, which are bored to various diameters to suit the particular projector in use. This hub, 5 ins. diameter, is a good example of the ease with which a comparatively intricate design can be moulded in plastics in place of diecast metal.

Pencil Refill Container

A polythene container for propelling pencil refill leads is moulded by E. Shipton and Co., Ltd., Northwood Hills, Middx. The cap is joined to the tube by a thin piece of polythene which acts as the hinge. The container and cap are moulded in one piece.

Beach Toys

The fish, tortoise (or turtle) and duck seen in the illustration are in the form of moulds from which a child can produce repeated impressions in wet sand. They are made in cellulose acetate by Wood and Kotek, Ltd., 56-58, Turnham Green Terrace, London, W.4.

Vinyl-coated Fabric

Some new multi-colour patterns in "Zapide" vinyl-coated fabric, here illustrated, were shown at the Birmingham section of the 1950 B.I.F. by Ioco, Ltd., Netherton Works, Anniesland, Glasgow.

Educational Plaything

Toys designed by Hilary Page continue to acquire diversity in actual form and the precise manner of linking up child mind-training and play. The posting box, moulded in urea for Kiddicraft, Ltd., Kenley, Surrey, has an assortment of intricate shapes which can be "posted" in the box only through the appropriate opening.

New Toy

"Jacko the Monkey" is made by Injection Moulders, Ltd., Westmoreland Road, London, N.W.9. The monkey—injection-moulded in cellulose acetate—will perform complicated acrobatics if the wheels at the end of his bar are turned. The trestle holding the bar is also moulded from acetate.

"Open Day" at Works of Lacrinoid Products

LAST month we had the opportunity to visit the Gidea Park works of Lacrinoid Products, Ltd., the occasion being an "Open Day" for the public to stimulate interest in local industries.

This company came to Gidea Park, Essex, from London, in 1934, being then styled The London Button Company. Locally it is still known as "the button factory"—a title which appears justified considering that one and a half to two million buttons are produced per working day. Activities during the past 15 years, however, have widened considerably. During our tour through the various departments, in addition to buttons, we saw also in production a range of other plastics mouldings and fabrications, including luggage handles, door furniture, refrigerator parts, etc., the material for fabricated goods—cast phenolics, casein and acrylics—being in great variety of colour in the works' stores.

For moulding activities, the complete sequence of operations was thrown open for inspection. Pelleting is done mainly on Manesty pelleting machines, the production rate for pellets ½-inch diameter being of the order of 1,000 per minute. The moulding shops, devoted exclusively to compression and transfer moulding, are equipped mainly with Bradley and Turton presses, operating at pressures from 50 to 100 lb/sq. inch.

In the barrelling room, buttons and other moulded goods acquire their high degree of finish by being "tumbled" in rotating barrels in contact with small wood chips (or polishing pegs) and polishing compounds. Polishing pegs and buttons, on leaving the barrels, are automatically separated by passage over vibrating screens, the pegs being returned to the barrelling room to deal with a further batch of buttons from the moulding shops.

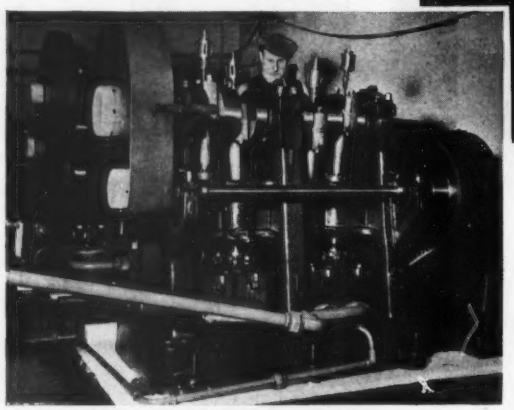
Button inspection is carried out upon mechanized endless belts, and the degree of inspection given is a matter upon which the company is particularly proud. As seen in one of our photographs, the operators nearest the camera first inspect one side of the buttons, which are then automatically turned and conveyed in the reverse direction so that undersides may be inspected by the operators seated furthest from the camera. This inspection equipment was specially designed for the company.

Oil pressure throughout the moulding shops is maintained by a battery of Bradley and Turton pumps, one of which appears among our photographs.

The company maintains a very efficient toolroom and engineering maintenance section. Here we observed a 500-ton Daniels' hobbing press engaged in making individual moulds for buttons from the master die. Here, also, Desoutter electric drills were finding good and somewhat novel use for periodically clearing the holes in some of the moulding tools. The highly skilled work of this toolroom was ably reflected in the "thinness" of the flash on some of the mouldings which we saw in production, thus requiring a very minimum of finishing after leaving the moulding press.

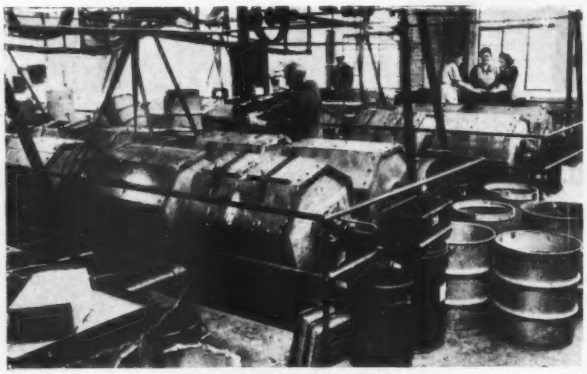
An interesting section of the works—not directly of plastics interest—is the production of "Opalite" glass buttons, which find an extensive market overseas, particularly among native races. These buttons are made from a mixture of powdered glass, china clay and pigment, preformed at 100 lb./sq. inch, and then passed through a gas-fired furnace (entering at 600 degrees C. and leaving at 800 degrees C.) upon an endless metal conveyor.

(Above) Corner of one of the moulding shops as equipped for compression and transfer moulding.



(Above) Part of the pump room.

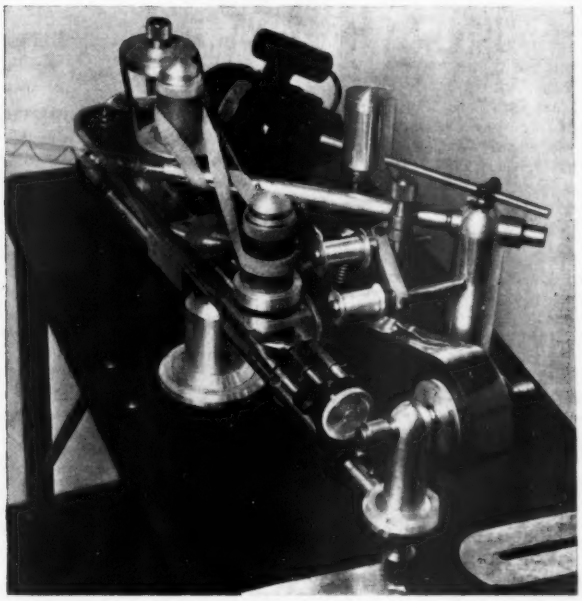
(Below) Button inspection: one of the endless belts for turning buttons so that both sides may be inspected.



(Above) General view of barrelling room.

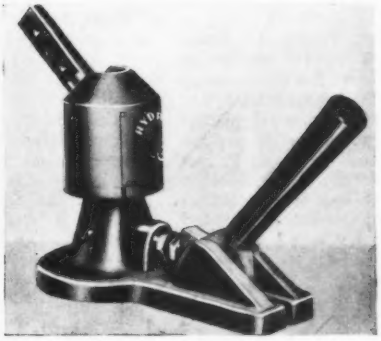
PRODUCTION NEWS

Raw Materials, New Plant, Works Organization, Control Apparatus, Research, Personal and Trade Notes

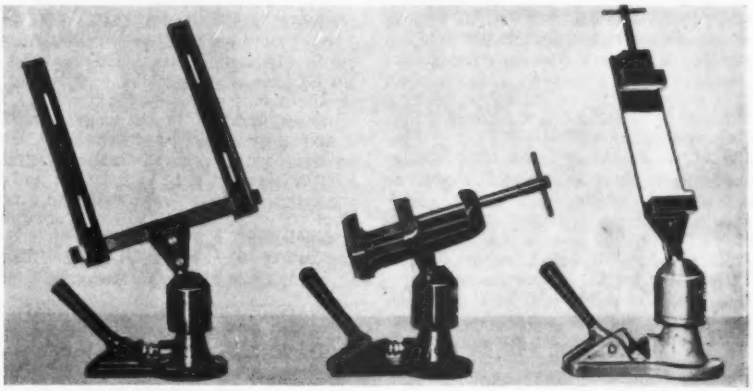


(Left) Machine for automatic spiral winding of cellulose acetate tubing.

(Above) The "Ekco" radioactive - type thickness gauge.



(Left) "Hydraclamp" for toolroom use, and (below) various jigs in use with this clamp.



SPIRAL WINDING.—A new-type winding machine which produces spirally wound "Celastoid" tubing in diameters from ⅛ in. to 2 ins. outside diameter was exhibited by R.B.K., Ltd., 23, King's Road, Sloane Square, London, S.W.3, at the Exhibition of "Celanese" Plastics held recently by British Celanese, Ltd., to which exhibition we refer elsewhere in this issue. Similar machines will shortly be available extending the range of diameters down to 3/32 in. and up to 4 ins. The speed of winding is 40 ft. of ¼-in. tubing per minute, increasing in the lower and decreasing in the higher diameters. By a simple additional operation the circular cross-section can be formed into a square or elliptical shape. Transparent packs made from these spiral windings are employed for toothbrushes, lipsticks, shaving sticks, table-tennis balls, sweets and hosiery. The spirally wound material is also used in the form of drinking straws.

HYDRAULIC CLAMP.—The "Hydraclamp" is an instrument which would find considerable use for the assembly and finishing shops of both mould makers and manufacturers of finished plastic products. By the use of a few selected jigs fitted to the arm of the clamp, any tool or assembly, up to a maximum weight of 1 cwt., may be fixed at any angle and held in position by a pressure of 3,000 lb./sq. in. A simple adjustment provides partial release of the clamp, to enable the operator to control with minimum effort any movement of heavy objects to fresh positions. This would be of special interest in the finishing of moulding tools where approach from different angles simplifies operations. The "Hydraclamp" is manufactured by All Precision Engineering, Ltd. The sole concessionnaires for home and overseas are Spencer, Franklin, Ltd., 292, High Holborn, London, W.C.1.

THICKNESS GAUGE.—By utilizing the effect of the absorption of radioactive particles and rays in material, measuring equipment can be calibrated in thickness for all forms of sheet or strip materials from very thin paper to thick sheet steel. There is no need for any mechanical contact for the measurement of the material. The main advantage of the system is that it can be used to measure material which is continuously flowing, as in the case of a plastic such as p.v.c.

In one method a single source of radioactive particles and a single ionization chamber are used, the material to be measured being placed between the two. An electrometer connected to the ionization chamber will then show a current reading which, regarding the source strength and chamber geometry as a constant, will depend upon the mass of the material between them.

In alternative methods, the standing ionization current is cancelled out, by using respectively a stable reference potential or an identical source and chamber connected in opposition. The electrometer will now read the change in ionization current caused by variations in the mass of the material being measured. A dial may be calibrated directly in weight, and by means of a chart this can be translated into thickness.

The "Ekco" radioactive thickness gauge, introduced by the Electronics Division of E. K. Cole, Ltd., incorporates a vibrating reed electrometer as the current measuring device. The equipment is built in such a form that the measuring source and chamber are available for remote mounting. Provision is made for the use of a recorder to give a continuous record of thickness variations. Special installations are provided in which the thickness of the material can be automatically controlled, or warning given of deviations exceeding set limits.

With a suitable choice of radioactive source most materials can be measured in sheet or strip form and an accuracy of 1 to 2 per cent. easily obtained up to speeds of 5 to 6 feet per second using standard equip-

ment. Greater speeds than this can be catered for, but extra shielding is necessary and each installation would need individual investigation. With the standard equipment, using thallium 204 as the source of radioactivity, the accuracy of measurement for paper and plastics .005 to .036 inch thickness is 1 per cent.; .0025 to .100 inch thickness, 5 per cent. Other ranges of thickness can be catered for by using alternative sources.

TENAPLAS, LTD., have just completed a £5,000 acid plant contract for a firm in Belgrade. The installation, which is of polythene, includes over 5,000 ft. of extruded 3-in. tubing, 1,200 flanges and more than 1,800 ft. of welding. It is to be used for acid distribution.

EDUCATIONAL COURSES.—A series of advanced courses in the Chemistry and Technology of Plastics have been planned to take place at the Acton Technical College, during the Session 1950-51. The courses are part-time and are designed for chemists and engineers engaged in the industries associated with the manufacture and use of plastics materials. Syllabuses will cover the requirements for the Associateship of the Plastics Institute. The sessional fee for courses on Chemistry and Technology of Plastics, or Plastics Machines and Mould Design and Technology of Plastics, is 35s.; single subject, 20s. Full particulars and registration forms may be obtained from the Principal, Acton Technical College, High Street, Acton. London, W.3.

HORNERS COMPANY AWARDS.—The Council of the British Plastics Federation, as administrators of the Worshipful Company of Horners Awards, offer a prize of the value of 50 guineas for a design of an article made wholly or mainly in plastics, the design to be set out as a drawing with a written description of the proposed process of manufacturing the article and accompanied by a three-dimensional model or mock-up of the article.

Entries will be restricted to a small number of specified articles, but the candidate is at liberty to select any one from: (i) Equipment for the preparation and serving of food and drink, such as cup, saucer, plate, beaker, condiment set, trolley and canteen equipment; (ii) kitchen equipment, such as trays, racks, containers and fittings; (iii) nursery equipment. The prize is open to employees of twelve months' standing or more with member-firms of the British Plastics Federation. Neither the Federation nor the Worshipful Company of Horners claim any copyright in the designs submitted.

Entries should be sent to the General Manager, British Plastics Federation, 47-48, Piccadilly, London, W.1, so as to reach him not later than August 31, 1950.

PACKAGING STANDARDS. — The British Standards Institution has now published six of the 17 sections which will comprise its full Packaging Code. The Code has been systematically revised since it was first introduced in 1943 for the guidance of the Services and Government Departments during the war, and may now be described as the British Standard Packaging Code for industry. The complete Code covers:—(1) Choice of containers and methods of packaging; (2) storage of containers and packaging materials; (3) addressing, marking and identification; (4) mechanical handling of packaging materials and filled containers; (5) protection against pest and mycological attack; (6) protection against corrosion; (7) paper wrappers and containers (including films, foils and laminates); (8) wooden containers; (9) textile bags, sacks and wrappings; (10) metal containers; (11) packaging felt; (12) cushioning materials other than felt; (13) cordage; (14) adhesive closing and sealing tapes; (15) tensional steel strapping; (16) adhesives for packaging; (17) wicker and veneer baskets. Sections 1, 2, 3, 9, 11 and 15 have already been published and may be obtainable from the British Standards Institution, 24, Victoria Street, London, S.W.1, at prices varying from 2s. to 5s. each. Sections 4, 5, 6 and 7 are in an advanced state of preparation; Sections 8, 14 and 17 are due for publication. The Institution has also recently published, outside the Code, a British Standard for Fibreboard drums for overseas shipment (B.S. 1596), price 2s.

PURCHASE TAX.—The Commissioners of Customs and Excise, after consultation with Trade Associations concerned, have reviewed the liability to Purchase Tax, under Group 7 of the Tax Schedule, of certain plastic sheeting. In general, plastic sheeting, whether plain, printed or processed, is regarded as chargeable up to and including .015 inch in thickness. Within this range, however, the following sheetings are not now to be regarded as chargeable:—(a) Sheetings which are non-pliable; (b) sheetings backed with paper; (c) sheetings over .012 inch in thickness with "leather effects," e.g., those which by reason of having an embossed, glazed or similar finish have the appearance of patent or fancy leathers.

CELLULOSE ACETATE PLASTICS.—A 24-page cloth-bound booklet recently issued by the Plastics Division of Courtaulds, Ltd., gives a general guide to the cellulose acetate plastics manufactured by this company. The processes involved in the manufacture of moulding powders and extrusion compounds are described and illustrated. Further chapters deal with testing and the properties of the material, and with general hints on injection moulding, extruding and manipulation. Copies may be obtained on application to Courtaulds, Ltd., Plastics Division, Little Heath, Coventry.

CHANGE OF NAME.—By special resolution and with the consent of the Board of Trade, Victor H. Iddon, Ltd., have changed the company's name to Nettle Accessories, Ltd. The management of the company remains the same and the address continues to be Harper Road, Wythenshawe, Manchester.

CONGRATULATIONS.—T. H. and J. Daniels, Ltd., of Stroud, inform us that Mrs. H. M. Derrick, of their Export and Technical Hydraulics Sales Department, has been elected an A.M.I.Chem.E. She is the first woman ever to have achieved this distinction. May we add our very special congratulations to Mrs. Derrick.

MR. F. SPROXTON, technical director, BX Plastics, Ltd., received an O.B.E. in the recent King's Birthday Honours.

CHINA TRADING CORPORATION, York Buildings, P.O. Box 716, Hong Kong, wish to establish connections on an agency basis with United Kingdom manufacturers of plastic combs and toys, tooth-brushes, and electrical equipment.

DOLLAR EXPORT INQUIRY.—The New York Merchandize Co., Inc., 32-46, West 23rd Street, New York 6, N.Y., wish to be put in touch with United Kingdom manufacturers of toys, novelties and household ware in the lower-priced fields. Further information may be obtained from the Board of Trade, Commercial Relations and Exports Department, quoting the reference CRE(IB) 51815/50.

MOULDING POWDER IMPORTS.—The British Plastics Federation reports the following details of private account imports of moulding powders for April, 1950:—

Licences issued:	Tons	£
Cellulose acetate - butyrate (U.S.A.)	19	7,174
Polystyrene (Canada) ...	12	2,499
Polystyrene (Germany) ...	—	—
Arrivals:		
Cellulose acetate - butyrate (U.S.A.)	1	391
Polystyrene (Canada) ...	236	40,765
Polystyrene (Germany) ...	2	446

(Above) Mr. P. L. Jensen, manager of L. J. Herman and Co., Melbourne, arrived in England during April, to visit his firm's principals, British Geon Ltd. and British Resin Products Ltd. He is studying the end uses of the resins in which his company is interested, and processing equipment.

(Left) Mr. F. H. Hockey, general manager of Casolin Pty. Ltd., Sydney, has recently been in London. Besides being an active member of the Plastics Institute of Australia, he is also President of the Plastic Moulders Section of the Metal Trades Employers Association of New South Wales.

Successful Designing for Plastics Moulding—XII

By W. M. HALLIDAY

In this instalment the author considers still further the design of some typical components with particular reference to the location of flutings, grooves, etc., on the side walls of the moulding

VERY often the component designer will desire to incorporate flutings, grooves or similar decorative features on the sides of a component in order to enhance the external appearance of the part. The use of such features is generally likely to be very advantageous and economical for breaking excessively large and flat surface areas.

When such features have to be disposed in the manner shown at A (Fig. 1), some care will have to be taken in their selection and application in relationship to the normal parting-line plane of the mould.

The example at A, showing a very common type of hollow box moulding, depicts two widely used forms of grooving or fluting. The mould parting line lies along the plane "a—a," thus ensuring that the whole of the cavity formation for producing the external shape of the part can be provided within one mould block. A stationary core plug fixed to the opposite mould block forms the internal opening in the part, the latter being extracted from the core in the usual fashion.

Located vertically upon the long front side of the component are two wide grooves flat on the bottom and of considerable width. It should be noted that these grooves extend over the full height of the side right to the top face coincident with line "a—a." At the opposite long side to the left, five shallow flutings of semi-circular shape are provided, and again these items are extended up to the top edge of the component.

The effect of grooving, etc., of this character is to form an irregular edge at the flash line, and as a result the removal of the flash material when cleaning up the component after moulding will be appreciably more difficult.

Trimming of the flash would have to be performed by means of a die trimming tool, and there would be some risk of damaging the lower surfaces of the grooves or flutes, etc., in its passage through such a die. Should very thick flash occur at this point, as is likely with a compression moulding, there would also be some danger of destroying the sharp edge on the perimeter of the top surface, and a very unpleasing appearance would thereby result.

The sectional illustration given at B (Fig. 1) shows a very effective modification to the original design A, which may often be adopted with excellent results for overcoming or avoiding the aforementioned snags.

With this adapted design shape it will be noted that a beading has been provided at the top edge of the moulded article, this beading being situated as a slight projection on the external sides. The grooving and flutes are carried up to the under side of the beading as indicated. The mould parting-line surface coincides with the plane "a—a," as before.

The introduction of a simple beading of this character will be very convenient as far as mould construction is concerned, the only additional machining being entailed is that of enlarging the mouth of the cavity on all four sides for a sufficient depth equivalent to the thickness of beading desired. Since such a beading is flat-topped, and does not have to match up with any portion in the opposite mould block, it will be comparatively easy to reproduce this extra shape in the mould cavity.

In respect of flash removal, a very great advantage will be obtained, because the flat, open-top edge of the part may be finished on a smooth sanding belt and the component will not be required to pass through a trimming die at all.

Provision of such a beading will also usually greatly add to the appearance value of the finished article. It will be specially noted that this beading is, in effect, a quarter-circle in shape. This is the simplest form as far as mould matching is concerned. If a semi-circular beading were to be employed, half the form would have to be machined into the movable mould block as well, and therefore a critical matching requirement would arise. The flash would then be produced along the crest of the beading, and its removal would in all probability have to be effected by means of a trimming or shaving die of the kind mentioned earlier.

These two examples, representative of the application of beadings to improve surface appearance and reduce flash-trimming requirements, well illustrate the importance of a balanced relationship between their location and the parting-line surface in the mould. They also show in what manner flutings, grooves, etc., on the sides of a component should be located to ensure simplest flash removal.

The diagrams at Fig. 2 illustrate yet another very important type of parting-line layout for a mould which deserves mention at this stage.

Referring to the first example, shown at A, this is an outline view, in front and plan elevation, of a simple knob component. This member comprises a conical bossed portion having a spherical

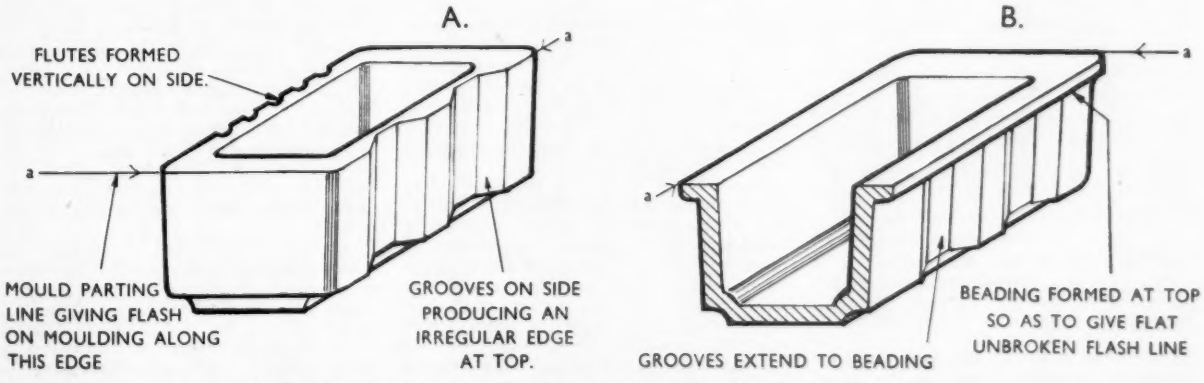

A.
B.
FLUTES FORMED VERTICALLY ON SIDE.
a
a
a
a
MOULD PARTING LINE GIVING FLASH ON MOULDING ALONG THIS EDGE
GROOVES ON SIDE PRODUCING AN IRREGULAR EDGE AT TOP.
GROOVES EXTEND TO BEADING
BEADING FORMED AT TOP SO AS TO GIVE FLAT UNBROKEN FLASH LINE

Fig. 1.—Flutings and similar decorative features on the sides of a moulded component.

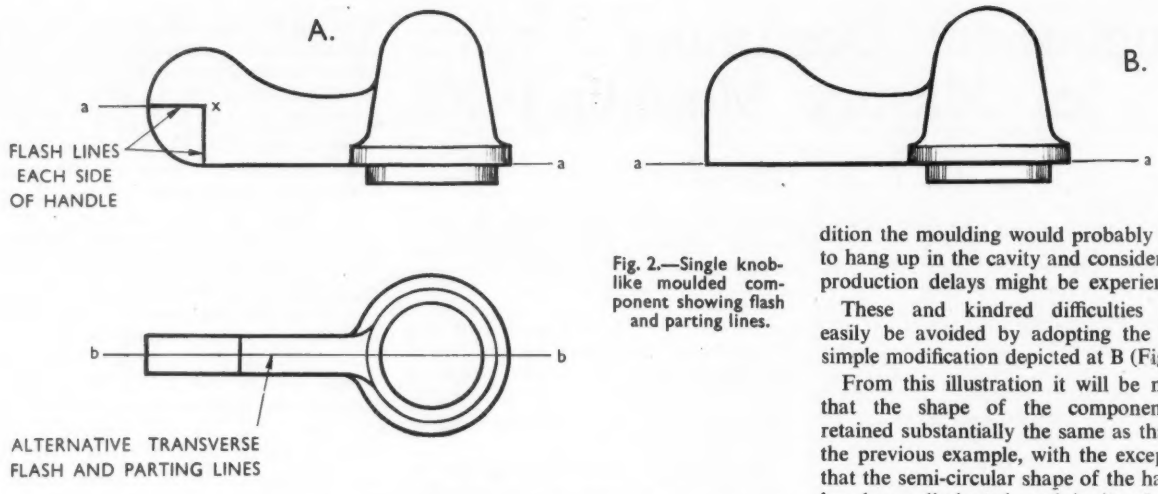


Fig. 2.—Single knob-like moulded component showing flash and parting lines.

apex, and joined to one side of this member is the integral handle portion, by means of which the knob may be rotated by finger pressure.

The extreme left-hand side of the handle portion is formed semi-circular in shape, wherein lies the particular difficulty of parting-line location to be considered. To produce this part as a compression or injection moulding would require the moulding tool to be parted along the line "a—a," which plane passes along the flat base of the conical boss and straight portion of the handle up to the vertical centre line of the rounded end thereof. At this point the parting line lies at right angles to the former portion and extending up to the centre X, from which point the radiused end of the handle is located. Continuing from point X, the parting line then extends horizontally parallel with the first long, straight portion to the end of the component.

Thus a stepped parting-line surface will be necessary in the mould, and these members would have to be accurately matched up, especially on the short vertical step passing from the base of the moulding up to the centre point X.

On the finished component the flash line would therefore follow the line "a—a" just described, and the component would probably have to be finished on the sanding belt on the front and rear sides of the semi-circular portion of the handle to remove such flashing. This operation would embrace some risk of damaging the polished surfaces of the handle unless performed with extreme carefulness.

It would be possible, however, to reproduce this component from a mould parted in a somewhat different manner, but again certain disadvantageous features would arise.

For example, the parting line might be located in the manner shown in the lower plan view at A, which is denoted by the transversely situated line "b—b." With such a mould layout, each half of the moulding beyond the line "b—b" would have to be machined into one mould block, and the two members correctly matched together to ensure perfect alignment of the two cavity portions throughout the entire perimeter of the component.

This would entail a considerable increase in the manufacturing operations involved in the mould production, especially in respect of the formation of the half-conical portions for the main-boss stem of the part.

The stepped form of mould parting will be necessary in order to ensure that the finished component can be extracted from the mould cavity during ejection. Should there be any slight error or discrepancy in the disposition of the short, vertical, stepped portion relative to the centre point of the semi-circular end of the handle cavity, denoted at X, the result would be to cause one portion of the cavity to be deeper or greater than a true quarter-circle. With such a condition the moulding would probably tend to hang up in the cavity and considerable production delays might be experienced.

These and kindred difficulties may easily be avoided by adopting the very simple modification depicted at B (Fig. 2).

From this illustration it will be noted that the shape of the component is retained substantially the same as that of the previous example, with the exception that the semi-circular shape of the handle has been eliminated, and in its place a quarter-circular shape has been substituted.

The employing of such a shape as this will render it possible to have a perfectly straight and flat parting line in the mould. This is clearly depicted by the line "a—a." The flashings formed on the component will, therefore, be situated on the flat bottom edge of the part, being wholly confined to this point, and will not occur on the smooth flat sides of the handle, as is the case with the earlier example.

The construction of the mould will also be appreciably simplified in that the parting-line surfaces of each block will lie entirely in one plane, and they will be flat instead of stepped, thereby rendering the task of sealing them together very much easier.

No difficulties would be experienced in regard to the safe ejection of the finished mouldings from the cavity area, as would be prone to occur in connection with the preceding example.

(To be continued.

Diamond Powder for Polishing Plastic Moulds

The polishing of hardened moulds seems to be facilitated by the use of finely graded diamond powder. In particular during the past few years, diamond pastes came on the market in the form of fine diamond powder mixed with oils and chemicals to give a permanent consistency. The paste is supplied in collapsible tubes and is therefore extremely economical in use.

One of the leading plastics moulding plants on the European Continent recently had the opportunity to use a diamond powder paste of American origin for the first time and had excellent results in working on various moulds in their laboratory plant. They used five different grades of paste on several types of steel, both hardened and unhardened, and were not only impressed by the fact that they obtained a high lustre on the mould surface, but especially by the short time in which polishing could be effected. They made their experiments with an injection mould, the form-giving parts of which had a surface hardness of 58 deg. Rockwell (oil-hardened die steel); further with a bakelite mould (oil-hardened die steel), between 54 deg. and 60 deg. Rockwell, and with a preform mould (air-hardening tool steel). Generally the results were excellent, both relative to the mirror-like surfaces obtained as also to the rapidity with which the polishing was effected.

Summaries of patents available for licence on plastic fabrications, including motorcar accessories, electrical equipment, household products, toys, etc., are given in "Plastic Products and Processes," prepared by U.S. Patent Office, copies of which may be obtained on application to Superintendent of Documents, Washington, D.C.

PATENT REVIEW

The following abstracts have been made from specifications at the Patent Office, with the permission of the Controller of H.M. Stationery Office. Complete specifications can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 2/- each.

B.P. 635,389. Appl. 3.9.46. Conv. (Germany) 17.9.43. Acc. 26.4.50.
Presses for the manufacture of hollow articles from rubber or other thermoplastic material. To: Bata Narodni Podnik.

Core moulding process with jaws of press closing against the core during moulding.

B.P. 635,733. Appl. 26.8.47. Acc. 12.4.50.
Improvements in, or relating to, the manufacture of organo silicon esters. J. G. Fife. Comm. from Dow Corning Corp.

B.P. 635,757. Appl. 10.5.46. Acc. 19.4.50.
Process for the manufacture of hydrocarbon polymers. C. Arnold. Comm. from Standard Oil Development Co.

Polymerization of materials such as cyclopentadiene at low temperatures in the presence of a Friedel-Crafts catalyst.

B.P. 635,787. Appl. 31.7.47. Conv. (U.S.A.) 4.4.44. Acc. 19.4.50.
Polymerization of butadiene-1.3. hydrocarbons. B. M. G. Zwicker. To: B. F. Goodrich Co.

B.P. 635,798. Appl. 20.12.48. Acc, 19.4.50.
Improved synthetic resin. E. H. G. Sargent.

Synthetic resin of the "C" stage is produced by reacting a C_{12} to C_{22} fatty acid amide with an equi-molecular proportion of formaldehyde. The reaction product is mixed with phenol or cresol and formaldehyde and condensed in the presence of an alkaline catalyst.

B.P. 635,866. Appl. 17.12.47. Acc. 19.4.50.
Cyanalkyl ether plasticizers, and synthetic resin compositions plasticized therewith. D. Faulkner. To: Distillers Co., Ltd.

New plasticizers for polyvinylidene chloride.

B.P. 635,911. Appl. 18.4.47. Conv. (U.S.A.) 25.4.46. Acc. 19.4.50.
Synthetic resinous compositions I. V. Runman. To: General Aniline and Film Corp.

Products obtained by mixing a polymeric vinyl ether and a resinous condensation product of a phenol with acetylene.

B.P. 635,912. Appl. 17.5.47. Conv. (France) 5.2.43. Acc. 19.4.50.
Process for the partial depolymerization of polymerized methyl methacrylate. To: Société Générale de Constructions Electriques and Mecaniques (Alsthom).

Method of making scrap of methyl methacrylate products usable by lowering the molecular weight of the material. This is achieved by heating up comminuted powder to 200 degrees C., intensively kneading in a worm extruder and extruding in the form of thin filaments. The partially depolymerized material can subsequently be used for moulding and similar processes.

B.P. 635,927. Appl. 28.7.47. Acc. 19.4.50.
Preparation of organo-silicon resins. M. Todd, C. Shaw and W. E. Langrish-Smith.

Preparation of resins by heat treatment of tetra (ρ-Alkylaryl) silicates in a moist atmosphere.

B.P. 635,986. Appl. 30.10.46. Conv. (U.S.A.) 12.8.44. Acc. 19.4.50.
Vinyl resin synthetic rubber compositions and method of preparing same To: B. F. Goodrich Co.

Method of producing mixtures of vinyl resins and butadiene–1, 3 acrylic nitrile synthetic rubbers for manufacture of films and coatings free from liquid plasticizers.

B.P. 635,991. Appl. 30.11.46. Acc. 19.4.50.
Injection moulding apparatus. V. Vltavsky.

High-capacity injection moulding machine with pre-melting chamber to facilitate injection of large volumes without the use of very high pressure.

B.P. 635,994. Appl. 7.1.47. Conv. (U.S.A.) 21.1.46. Acc. 19.4.50.
Improvements in the manufacture of siloxane resins. H. N. Fenn, L. A. Rauner and W. W. Pedersen. To: Dow Corning Corp.

B.P. 635,995. Appl. 7.1.47. Conv. (U.S.A.) 21.1.46. Acc. 19.4.50.
Improvements in the manufacture of siloxane resins. H. N. Fenn and L. A. Rauner. To: Dow Corning Corp.

B.P. 636,019. Appl. 30.1.48. Conv. (U.S.A.) 3.2.45. Acc. 19.4.50.
Creaming of synthetic rubber latices. To: United States Rubber Co.

A mixture of a plurality of synthetic rubber latices is creamed with a hydrophilic colloidal creaming agent.

B.P. 636,034. Appl. 10.4.47. Conv. (U.S.A.) 30.4.46. Acc. 19.4.50.
Improvements in or relating to acrylonitrile. To: American Cyanamid Co.

Preparation of acrylonitrile from hydrocyanic acid and acetylene at 400-500 degrees C. in the presence of activated carbon, silica gel and metal cyanides.

B.P. 636,055. Appl. 23.7.47. Conv. (U.S.A.) 27.1.40. Acc. 19.4.50.
Improvements in or relating to co-polymers of acrylonitrile with lesser amounts of conjugated dienes. To: B. F. Goodrich Co.

B.P. 636,110. Appl. 2.5.46. Conv. (Italy) 18.9.42. Acc. 26.4.50.
Injection-moulding thermoplastic synthetic resins. Lavorazione Materia Plastiche.

Extrusion moulding machine for plastics which is fitted with an electrically heated die system to ensure good flow of the material leaving the scroll of the extruder. Reference to B.P. 634,071 and 626,109.

B.P. 636,198. Appl. 17.1.47. Conv. (Germany) 25.6.40. Acc. 26.4.50.
Method of producing polyamides. Bata Narodni Podnik.

Refers to U.S. Patents 2,130,523; 2,130,947 and 2,130,948, and B.P. 523,506. Polycondensation of dicarboxylic acid with diamides of the structure: $H_2N\ (CH_2)n\ NH_2$ where n is a whole number between 4 and 15.

B.P. 636,207. Appl. 1.4.47. Conv. (U.S.A.) 10.4.46. Acc. 26.4.50.
Production of interpolymers. To: B. F. Goodrich Co.

Polymerization of monomeric materials comprising at least 30 per cent. by weight of a vinylidene halide and at least 1 per cent. by weight of a di-ester of maleic acid. Products used for manufacture of films and fibres, extrusions and mouldings. Excellent stability to heat, light and solvents is claimed without the use of an additional stabilizer.

B.P. 636,232. Appl. 7.8.47. Conv. (U.S.A.) 28.3.41. Acc. 26.4.50.
Polymerization of vinyl halides. To: B. F. Goodrich Co.

Polymerization catalysts or "Initiators" in the form of inorganic compounds containing sulphur and oxygen, used for polymerization process.

B.P. 636,238. Appl. 21.8.47. Conv. (U.S.A.) 10.5.40. Acc. 26.4.50.
Improvements in or relating to synthetic rubberlike materials. To: B. F. Goodrich Co.

Co-polymerization of a diene hydrocarbon, an acrylic nitrile and an aryl olefin, e.g., butadiene, acrylonitrile and styrene. Improved physical properties are claimed

B.P. 636,275. Appl. 20.10.47. Acc. 26.4.50.
Improvements in the manufacture of flexible strip material. J. Veit. To: Duratube and Wire, Ltd.

Stamped and embossed thermoplastic strips with dome-shaped protuberances, yielding a high degree of extensibility. Used for braces, suspenders, etc.

B.P. 636,233. Appl. 7.8.47. Acc. 26.4.50.
Improvements in and relating to the manufacture of plastic articles. P. G. T. Hand, J. F. Clark and A. E. Judd. To: B.X. Plastics, Ltd.

Colouring process for thermoplastics where the dye is admixed to moulding powder, the powder extruded in single, double or mottled colour effects.

B.P. 636,318. Appl. 23.5.46. Conv. (U.S.A.) 23.6.45. Acc. 26.4.50.
Colourless polymers of alpha-haloacrylic acid derivatives. C. E. Barnes. To: General Aniline and Film Corp.

B.P. 636,320. Appl. 23.5.46. Conv. (U.S.A.) 23.6.45. Acc. 26.4.50.
Method of forming resinous products derived from haloacrylic-acid compounds. W. O. Ney. To: General Aniline and Film Corp.

B.P. 636,321. Appl. 23.5.46. Conv. (U.S.A.) 23.6.45. Acc. 26.4.50.
Polymerization of haloacrylic-acid compounds. C. E. Barnes and W. O. Ney. To: General Aniline and Film Corp.

B.P. 636,322. Appl. 23.5.46. Conv. (U.S.A.) 23.6.45. Acc. 26.4.50.
Polymerization of alpha-substituted haloacrylic compounds. C. E. Barnes. To: General Aniline and Film Corp.

B.P. 636,323. Appl. 1.7.46. Conv. (U.S.A.) 26.7.46. Acc. 26.4.50.
Polymerization of alpha-haloacrylic compounds. C. E. Barnes and W. O. Ney. To: General Aniline and Film Corp.

B.P. 636,348. Appl. 18.6.47. Acc. 26.4.50.
Production of synthetic polymers. S. J. Allen and J. G. N. Drewitt.

Polyamides produced by reacting a di-ester of oxalic acid with a di-primary amine without application of heat.

B.P. 636,361. Appl. 25.8.47. Conv. (U.S.A.) 1.9.42. Acc. 26.4.50.
Synthetic rubberlike materials. To: B. F. Goodrich Co.

Polymerization of butadiene acrylonitrile and styrene.

B.P. 636,385. Appl. 27.3.46. Conv. (U.S.A.) 31.8.45. Acc. 26.4.50.
Method of polymerizing vinylidene group-containing liquid monomeric compounds. To: Glenn L. Martin and Co.

Polymerization of vinylidene compounds in the absence of emulsifiers, suspension stabilizers or dispersing agents.

B.P. 636,400. Appl. 18.2.47. Conv. (France) 20.2.46. Acc. 26.4.50.

Plasticizers for polyvinyl chloride. To: Cie. Francaise de Raffinage.

Addition of materials, such as chloro-alkyl chloro-benzene, to ordinary plasticizers, such as tricresyl phosphate.

B.P. 636,420. Appl. 1.12.47. Acc. 26.4.50.

Production of polymeric esters. E. R. Wallsgrove and F. Reeder. To: Courtaulds, Ltd.

Production of improved polymeric esters suitable for preparation of fibres which can be cold-drawn. Condensation of an ω, ω-dicarboxylic acid or terephthalic acid or a bifunctional derivative of such acids with a di-ester of an aliphatic monocarboxylic acid and an aromatic dihydroxy compound.

B.P. 636,476. Appl. 2.2.49. Acc. 3.5.50.

Production of textile materials having a basis of polyacrylonitrile. E. B. Johnson and J. Downing. To: British Celanese, Ltd.

Stretching of acrylonitrile yarns which are made up from extruded filaments, stretching being effected in a softened condition with an aqueous oil emulsion to prevent sticking together of filaments.

B.P. 636,496. Appl. 6.8.47. Conv. (U.S.A.) 3.12.42. Acc. 3.5.50.

Method of producing a composite synthetic resin and product thereof. To: Koppers Co., Inc.

Composite two-stage resin made by condensing a primary aryl amine or a secondary di-aryl amine with an aldehyde: mixing this with a solution of unreacted aldehyde and poly-hydroxy benzene, reacting this under heat in the presence of the pre-condensed aromatic amine-aldehyde resin.

B.P. 636,535. Appl. 11.10.46. Conv. (U.S.A.) 24.12.42. Acc. 3.5.50.

Synthetic resin latices and method of making same. To: B. F. Goodrich Co.

Polymerization of a monomer mixture consisting of a vinyl or vinylidene chloride with an ester of acrylic acid in aqueous emulsion in the presence of an emulsifying agent and a catalyst, in the absence of atmospheric oxygen.

B.P. 636,559. Appl. 3.6.47. Conv. (U.S.A.) 13.11.46. Acc. 3.5.50.

Production of alkyhalosilanes. A. J. Barry, L. de Pree and D. E. Hook. To: Dow Corning Corp.

B.P. 636,690. Appl. 27.6.47. Conv. (U.S.A.) 28.6.46. Acc. 3.5.50.

Improvements in or relating to the bonding of a sole to the welt of a welded shoe by use of the heating effect of a high-frequency electric field. G. T. Hart. To: British United Shoe Machinery Co.

Reference to British Patents: 538,405, 555,054, 594,993 and 599,298. Reciprocating bar H.F. welder specially adapted for welding of thermoplastic soles to shoes. The reciprocating movement of a bar carrying the upper electrode energizes the oscillator at the moment of gripping the material between upper and lower electrode and de-energizes the circuit subsequently.

B.P. 636,694. Appl. 78.47. Conv. (U.S.A.) 9.2.40. Acc. 3.5.50.

Reaction products of styrene and anacardic materials. To: The Harvel Corp.

Copolymerization with heat of a mixture comprising styrene and a phenolic liquid derived from the *anacardiaceæ* family of plants.

B.P. 636,695. Appl. 7.8.47. Conv. (U.S.A.) 6.2.43. Acc. 3.5.50.

Reaction products of styrene aldehydes and polymeric anacardic materials. To: The Harvel Corp.

See 636,694. Reaction of aldehydes with a solution in styrene of a polymer of cashew nut shell liquid.

B.P. 636,696. Appl. 7.8.47. Conv. (Switzerland) 8.8.46. Acc. 3.5.50.

Manufacture of a raw material for lacquers from resinous ethylene oxide derivatives of phenols, and lacquers made therewith. To: Ciba, Ltd.

B.P. 636,710. Appl. 20.2.48. Conv. (U.S.A.) 14.12.42. Acc. 3.5.50.

Reaction products of styrene, drying oils and anacardic materials. To: The Harvel Corp.

See 636,694.

B.P. 636,713. Appl. 2.3.48. Conv. (Italy) 12.4.47. Acc. 3.5.50.

Machines for admixing the ingredients of compositions having a base of elastic rubber or a like plastic. To: Pirelli Societa per Azioni.

Mixing and compounding machine with a rotary scroll which kneads the material and thoroughly mixes a number of ingredients.

B.P. 636,747. Appl. 9.6.48. Acc. 3.5.50.

Seam welding of thermoplastic material in sheet or strip form. R. D. C. Jackson and H. P. Zade. To: Communications Patents, Ltd.

Combined bar and roller H.F. welding machine which permits changing over from continuous to discontinuous welding quickly and efficiently.

B.P. 636,765. Appl. 7.8.47. Conv. (U.S.A.) 16.4.43. Acc. 3.5.50.

Improvements in torches for producing hot gaseous blasts particularly for welding thermoplastic materials W. M. Phillips. To: Udylite Corp.

Mixture of hydrogen and compressed air is burned in a combustion chamber. The combustion products in the form of steam and hot air emerge from the nozzle and are used for welding.

B.P. 636,847. Appl. 18.5.48. Conv. (France) 19.5.47. Acc. 10.5.50.

Method of locally heating vitreous material by high-frequency dielectric losses. To: Compagnie des Lampes.

Cutting and welding of glass tubes, rods, etc., by heating up the ends as a dielectric in a high-frequency field. A "solution" of high-loss material such as sodium potassium or lime containing solution is applied to the ends in order to obtain rapid heating. Reference to B.P. 616,251.

B.P. 636,904. Appl. 21.6.47. Conv. (U.S.A.) 22.6.46. Acc. 10.5.50.

Materials adapted for seaming together two portions of a workpiece in sheet form by use of the heating effect of a high-frequency electric field. M. F. Ashley. To: British United Shoe Machinery Co., Ltd.

Special high-frequency welder for shoe-soles working with a reciprocating system of electrodes and using a thermoplastic or thermosetting bonding agent between leather parts, the bonding agent being activated by passage of high-frequency current.

B.P. 636,905. Appl. 3.7.47. Conv. (U.S.A.) 6.1.47. Acc. 10.5.50.

Manufacture of organosilicon resins. M. J. Hunter, E. J. Smith. To: Dow Corning Corp.

Siloxane resins for use as paints and varnishes in the form of organo substituted polysiloxanes in which the substituent organic groups are methyl and phenyl radicals.

B.P. 637,053. Appl. 13.2.48. Acc. 10.5.50.

Methods of and apparatus suitable for use in attaching heels to shoes. British United Shoe Machinery Co. Comm. from United Shoe Mach. Corp.

Attaching heels to shoes by means of a thermoplastic/thermosetting compound, which is injected under pressure and subsequently cured by application of heat. Extrusion press is used for injection of the material into a cavity between heel and sole.

B.P. 637,110. Appl. 18.4.47. Conv. (U.S.A.) 19.4.46. Acc. 10.5.50.

Castor oil polybasic ester gels. To: British Thomson-Houston Co.

Gel-like compositions made from triethyl borate and castor oil, using tertiary-butyl hydroperoxide as a catalyst.

B.P. 637,137. Appl. 3.11.47. Acc. 10.5.50.

Extrusion apparatus. R. E. G. Harley. To: Pirelli-General Cable Works, Ltd.

Extruder for cable coverings of rubber or thermoplastic materials with provision for a filter between supply and extrusion die to prevent the incorporation of foreign matter in the extruded sheath.

B.P. 637,169. Appl. 12.10.46. Acc. 17.5.50.

Making of coloured designs and patterns on thermoplastic substances. K. O. Berry. To: Welch Holdings, Ltd.

Pre-cut thermoplastic sheets of desired shape and colour are superimposed on the base material and joined to it by application of heat and pressure.

B.P. 637,262. Appl. 10.9.47. Acc. 17.5.50.

Synthetic resins. H. Brunner, D. R. Tucker. To: I.C.I., Ltd.

Reaction under heat of a terpene phenol resin, a reactive phenol, a formaldehyde in the presence of an alkaline catalyst and an organic solvent. Used in manufacture of gels and gelatine.

BP. 637,267. Appl. 31.10.47. Acc. 17.5.50.

Manufacture of organic esters of cellulose. J. F. Neilson and J. A. Hawkes. To: British Celanese, Ltd.

Manufacture of cellulose acetate.

B.P. 637,342. Appl. 28.11.47. Conv. (U.S.A.) 29.11.46. Acc. 17.5.50.

Manufacture of cellulose propionate. To: British Celanese, Ltd.

Refers to B.P. 345,408. Tractional precipitation of propionate from solution in acetone, using an aqueous ethyl alcohol as precipitant at predetermined temperature.

B.P. 637,351. Appl. 8.4.48. Acc. 17.5.50.

Methods of, and apparatus for use in, attaching soles to shoes. British United Shoe Machinery Co. Comm. from: United Shoe Mach. Corpn.

Bonding of soles to shoes by means of plastic adhesive which is activated by heating (knife blade heater). Mechanically operated press for joining the cemented parts together. See also B.P. 636,904.

B.P. 637,395. Appl. 1.8.47. Conv. (U.S.A.) 27.1.41. Acc. 17.5.50.

Polymers and method of producing same. C. H. Alexander and F. K. Schoenfeld. To: B. F. Goodrich Co.

Production of polymers of improved dielectric properties from vinyl, vinylidene and other ethylenic compounds which are polymerized or copolymerized with each other. A small amount of buffer salt is used in the polymerization process, e.g. sodium meta silicate or the like.

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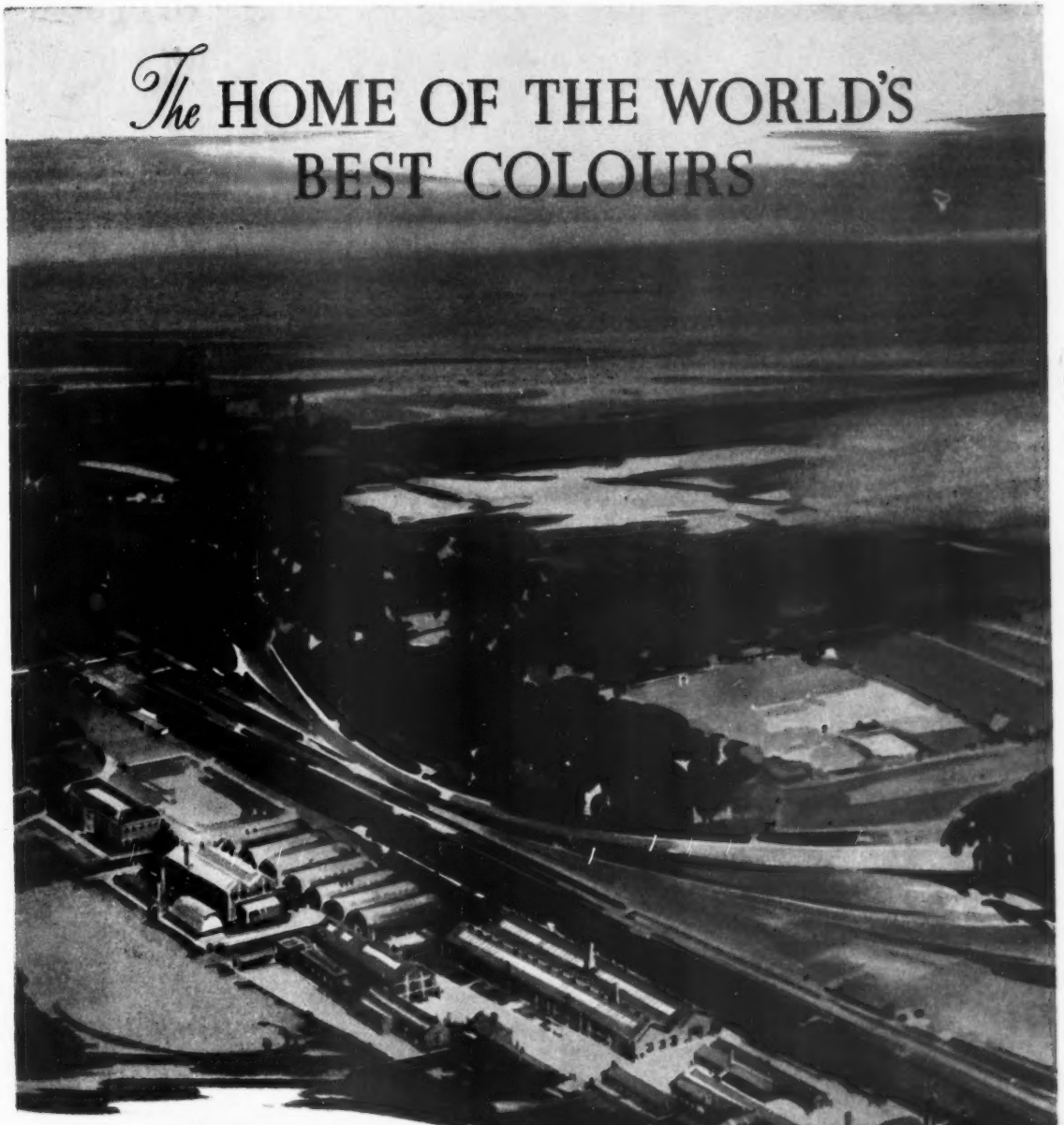

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